A QUESTION OF PRIORITY: ALEXANDER WOOD, CHARLES HUNTER AND THE HYPODERMIC METHOD

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The discovery of the use of the hypodermic syringe to introduce medicines into the body is generally attributed to Alexander Wood, one-time President and Secretary of the Royal College of Physicians, Edinburgh. Indeed the *Dictionary of National Biography* records that Wood's 'chief claim to remembrance...is the fact that he introduced into practice the use of the hypodermic syringe for the administration of drugs'.[1] However, contemporary documents reveal a different story.

In his lifetime, Wood was acknowledged to have discovered the method of delivering drugs under the skin by syringe and to have pioneered its use in a limited form – for the localised application of morphia to treat neuralgia. The more significant discovery of the full potential of the technique – its modern use as a means to administer a variety of drugs with the scope of a systemic therapeutic effect and thus relieve a wide range of conditions – was made by Charles Hunter, a London surgeon.[2] However, Hunter's contribution is now generally overlooked. This raises two questions: why did Wood fail to grasp the potential of his discovery and leave Hunter to develop the application of the hypodermic method? Also, why is Hunter's work ignored and Wood given priority for discovering the technique?

The answer to the first question lies, for a large part, in the professional circumstances of the two protagonists. When he made his contribution to the development of the hypodermic injecting method, Hunter was a young practitioner intent on building his career through scientific research. Alexander Wood, by contrast, was an established clinician. In the mid 1850s, when Wood made his original discovery, he had practiced in the Edinburgh 'New Town' for fifteen years and was a lecturer in the city's extramural medical school. He enjoyed a national, as well as a local, reputation: Wood had published on a variety of topics associated with medical practice and had served as Secretary of the Royal College of Physicians in 1850, taking a prominent role in Scottish medical politics.[3]

Wood discovered the hypodermic method through a combination of clinical observation and a leap of the imagination. In 1853 he was using 'the elegant little syringe made by Mr Ferguson of Giltspur Street, London' for its intended function – to introduce a caustic substance into a nevus in order to remove it.[4] Syringes with hollow needles were an accepted part of the doctor's armamentarium at this time: by 1867 at least three distinct designs were on the market.[5] By his own account, Wood suddenly realised that the same instrument could be used to apply drugs under the skin to treat neuralgia; he had been wrestling with the problem of dealing with this complaint for some time. Although neuralgic pain was situated close to the body surface, topical applications of analgesics had, in practice, little effect. Wood had already tried to introduce morphine under the skin using an acupuncture needle and to apply drugs after removing the outer layers of skin by scraping or blistering; the latter had proved successful but was hardly practical.[6]

Wood reported that he cured one case 'by applying *nux vomica* to the blistered surface; but I never tried it again, for it seemed likely to kill two people: my patient, an old lady, who nearly died of the poison; and myself, then a young doctor, who nearly died of the fright'.[7] Wood first tried using the syringe to administer morphia in November 1853 when treating one of his private patients, a woman suffering from a severe bout of neuralgia. He injected a solution of morphine close to the site of the pain. Although, by his own account, he was 'annoyed' to find that his patient slept for ten hours, he was delighted by the final result: the neuralgia was permanently relieved. Over the next two years Wood experimented with his new method in the treatment of a further eight cases.[8]

Wood published his discovery in the *Edinburgh Medical and Surgical Journal* in 1855, possibly to strengthen his candidature for the chair of medicine at the university. Much of the paper was taken up with defending the principle of the hypodermic administration of drugs. Wood cited experimental evidence on the relative rates of absorption by the stomach, lungs, and by incision, and concluded that hypodermic injection offered a rapid, reliable means of accurately administering medicines. He also reviewed the debate as to whether the generalised effects of morphine were due to absorption through the circulatory or lymphatic systems or by 'sympathy' via the nerves.[9]

Wood rationalised fairly swiftly the actual therapeutic action of morphia on neuralgia. He believed neuralgia to be a localised condition. Drawing on the work of Vallieux, Wood argued that the origin of neuralgic pain was located at a specific point on a diseased superficial nerve. The exact source of the problem could be detected by pressing on the skin: this would induce a sharp pain, even when the patient was not suffering from a neuralgic attack.[10] Injected morphia reduced the sensitivity of the morbidly irritable nerve in the immediate tissues and thus cured the pain. To support his theory of the localised action of morphine, Wood cited experiments by Müller – one of many physiologists interested in neural function at this period. Müller had demonstrated that the parts of an exposed frog nerve bathed in a weak morphine solution lost their irritability, while areas untouched by the drug were unaffected.[11] Although Wood claimed that neuralgia had a generalised component – a *habitus neuralgicus* – he was vague as to whether the generalised effects of morphine were beneficial in tackling this aspect of the condition. He was perhaps unsatisfied with his theorising. In a paper given in 1858 to an annual meeting of the British Medical Association held in Edinburgh, Wood admitted:

> The question may be asked, But how does this process act? I do not think I am bound to answer that question. It would be a sad puzzle to many of us, I suspect, if we

were asked how many other remedies which we use, act. We know the effect they produce; but often are unable to tell why it is so.[12]

Wood's method ultimately rested on its proven clinical utility. In 1858 he proudly reported that its use was 'nearly universal' in Edinburgh, and that it had been successfully used to treat a 'vast number' of cases. During the BMA conference, Wood took the opportunity to demonstrate his technique to some of the delegates, using two patients drawn from the city's Royal Infirmary.[13] Having discovered a method of dealing with a troublesome clinical problem, Wood was content to let the matter rest. He did not pursue the possibility of using other drugs to treat neuralgia or the application of the hypodermic method in treating other diseases.

Charles Hunter's work on the hypodermic method was undertaken in rather different circumstances to those of Alexander Wood. Born in 1835, the son of a London surgeon, Hunter was just setting out on his career when he became interested in the hypodermic administration of remedies. No details of his training have survived, but he qualified in 1856, becoming a licentiate of the Worshipful Society of Apothecaries and a member of the Royal College of Surgeons. He obtained a post as house surgeon at St George's Hospital, London and worked at the Royal Pimlico Dispensary.[14]

Hunter first tried Wood's hypodermic method of treating neuralgia on two of his patients at St George's. He followed Wood's method exactly, but was not entirely satisfied with the technique, noting that repeated injections at the same site caused irritation, thickening of the skin and ultimately abscesses.[15] He therefore experimented with injecting the drug away from the source of the pain, and found that this produced exactly the same therapeutic effect.[16]

Hunter, unlike Wood, was not content with clinical observation backed up by reference to the work of other physiologists – although he did later refer to the research of such luminaries as Claude Bernard. Reflecting developments in medical knowledge and research methods, and his own recently completed training, Hunter's approach was scientific and experimental. He set out to explore the limits of the hypodermic method, to reassess the relative merits of injection over other methods of administration, to determine whether other drugs could be applied in this way, and to establish their therapeutic value. He embarked on a series of animal experiments to establish the effect of various chemicals, and he exploited the freedom provided by his post at St George's Hospital to try out the drugs in a clinical setting. His results were quickly published as articles in medical journals and were collected in *On the speedy relief of pain and other nervous affections by means of the hypodermic method* (1865).[17]

Hunter's findings confirmed the value of the hypodermic technique and greatly extended its use. He concluded that the method offered a rapid and reliable means of introducing a number of alkaloid drugs, not just morphine but also atropine and strychnine, into the body without the side-effects experienced when these drugs are taken by mouth.[18] These substances had a general, not just a local effect, as Wood had claimed. Hunter believed that that the injected drugs acted in two ways, according to the substance applied. They induced a rapid primary effect on the heart and circulation, to either increase or decrease respiration and heart rate, and, in the case of morphine, to induce sleep. They then produced a slower secondary effect on the nervous system.[19] Morphine not only reduced the sensitivity of superficial nerves, but acted on all the cranial nerves. This meant that it was of benefit not only in neuralgia but in all forms of generalised nervous excitement, including melancholia, delirium, manic convulsions and *tic doloureux*. A 'tonic' effect also meant that morphia injections were valuable in treating patients suffering from 'cerebral nervous debility'.[20] Atrophine, by contrast, stimulated the nerves associated with the spinal cord, and was therefore beneficial in treating sciatica.[21]

Hunter's findings on the wider applicability of the hypodermic method were generally accepted by his contemporaries, while an attempt by Wood to challenge Hunter's priority was largely ignored. In 1865 Wood wrote to the *Medical Times and Gazette* simultaneously querying whether injected drugs were effective in generalised conditions and claiming priority for this medical discovery. He asserted that he had introduced 'the plan of using the cellular tissues as a medium for the introduction of remedies' and that Hunter had 'only slightly, if at all, modified some of the details' of the technique.[22] Wood's case rested on some rather speculative remarks in his original paper, where he had suggested that the hypodermic method would produce 'local and...remote effects', and that 'in all probability what is true in regard to narcotics will be found to be equally true in regard to other classes of remedies'.[23]

Given his extensive researches into hypodermic injection, Hunter naturally felt aggrieved by Wood's claims and vigorously defended his work. He pointed out that he had always cited Wood as the discoverer of the technique of using a syringe to inject drugs. However, he clearly differentiated between Wood's belief that morphine exerted a purely local effect on the superficial nerves and his consequently limited use of the technique, and his own explanation of the generalised effect of injected narcotics and his advocacy of the method to treat a variety of systemic complaints.[24] The dispute was brief: after two contributions from each side, the editor of the *Medical Times* declared 'We have now permitted both of these gentlemen to vindicate their claims, and can admit no further correspondence on the subject'.[25]

Medical opinion was clearly running in Hunter's favour. Strong confirmation of his views came from the Royal Medico-Chirurgical Society. After hearing a paper by Hunter, the Society's scientific committee set out to test his findings. They adopted Hunter's approach, conducting a comprehensive range of experiments, chiefly on animals, using a variety of narcotics. The committee also appealed for information from the profession through medical journals. The findings of the committee came down firmly on Hunter's side. It concluded that a variety of drugs, including atropine and quinine, were of benefit in the range of conditions identified by Hunter. Although the committee received reports of the successful use of injection to treat localised complaints, their experiments failed to find any evidence that 'the local predominated over the general effects'. It declared that there was no difference if the drug was introduced 'near to, or at a distance from the part effected'.[26] Other practitioners agreed: while no one stood up to support Wood, Francis Anstie, the editor of *The Practitioner*, championed the use of hypodermic injection in

the manner advocated by Hunter.[27]

This leaves the second question – if Hunter was clearly recognised as having made the significant contribution to the development of the hypodermic method in his own lifetime, why has posterity forgotten Hunter's work and awarded the laurels to Wood? The answer perhaps lies in the status of the two men. Hunter remained an obscure practitioner, partly because of his early death on 8 August 1878, at the age of 43. He published little after his work on the hypodermic administration of drugs, and although he served as President of the Western Medical Society and was a Fellow of the Royal Medico-Chirurgical Society, he never gained entry to the medical elite. On his death he was accorded no obituaries, only a brief notice in the *Medical Times*, and his name and his contribution to medicine quietly vanished.[28] Wood outlived his protagonist, dying on 26 February 1884, a much mourned pillar of the Scottish medical profession. Several obituarists recorded his achievements, including his discovery of the hypodermic method. Understandably, they did not mention the limited use which Wood made of his technique, nor of the disputed priority for its wider use. The obituary in the *British Medical Journal*, for example, reported that the profession was 'indebted' to Wood for the 'introduction of the hypodermic injection of drugs by the hollow needle-syringe'.[29] The notice in the *Edinburgh Medical Journal* even identified him as the 'inventor' of the hypodermic needle.[30] Later biographers accepted the obituarists' accounts; and thus Wood acquired a reputation in history which he had never enjoyed in life.

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