William Adams

A century has passed since William Adams began the study of orthopaedic surgery, in the development of which he played so outstanding a part. His attention was first directed to it by his great teacher, J. H. Green, F.R.S., the philosophical surgeon of St Thomas's Hospital, who believed "that Orthopaedy, as a new and special branch of study, in which not only the various forms of club-foot, but all the other deformities and malformations of the body were included as a group, opened up a wide field for pathological investigation and usefulness." Influenced by this belief in the expansive nature of orthopaedy, Adams in 1851 was encouraged to apply for the post of surgeon to the Royal Orthopaedic Hospital and was successful.

He was born on February 1, 1820, son of James Adams, L.S.A., of 39 Finsbury Square. In 1838 he entered the medical school of St Thomas's Hospital, of which hospital his father was Governor; but he studied anatomy and physiology at Webb Street School, Southwark, then under the management of Richard Grainger, younger brother of the founder. In 1842 the hospital obtained control of this school, retaining Grainger as demonstrator of physiology, and appointed Adams, who that year had become a Member of the Royal College of Surgeons, curator of the museum and demonstrator of morbid anatomy. He occupied this post for twelve years, during which in 1846 he joined with others in founding the Pathological Society of London. He became a Fellow of the Royal College of Surgeons in 1851 and three years later gave up his curatorship on appointment to the Grosvenor Place Medical School, adjoining St George's Hospital. Here he lectured on surgery and hospital practice, and delivered special courses of lectures on orthopaedic surgery—Thomas Spencer Wells was a fellow lecturer. After his election to the Royal Orthopaedic Hospital he was appointed surgeon to the Great Northern Hospital (now the Royal Northern Hospital) and to the National Hospital for the Paralysed and Epileptic.

Adams began as a general surgeon but his association with the Royal Orthopaedic Hospital, within a dozen years of its foundation, coupled with the influence of W. J. Little's teaching, aroused in him so absorbing an interest in the problem of crippling that his practice became almost confined to the treatment of deformities. He was well trained for the investigation of disabilities of the human frame, for he had spent a long apprenticeship at a pathological museum in the study of morbid anatomy. This scientific discipline coloured his every approach to any problem of deformity and is manifest in most of his contributions to orthopaedic surgery. In 1855 he began his researches on the repair of tendons, an inquiry which had already attracted the attention of Hunter and Paget, each of whom had carried out a good deal of experimental work in connection with it. Adams approached the subject afresh and communicated the results in papers to the Transactions of the Medical and Chirurgical and of the Pathological Societies, which he expanded to form a monograph entitled "On the Reparative Process in Human Tendons," published in 1860. The Achilles tendons were divided in sixteen rabbits at different dates and the parts were removed from the second to the sixty-second day after tenotomy. The process of tendon repair in the rabbit was also compared with that occurring in man. Adams was the first to observe the nature of human repair in a series of patients. During a period of nine years at the Royal Orthopaedic Hospital he was able to examine in the recent state fifteen patients in whom subcutaneous tenotomy had been performed at periods ranging from four days to three years previously, the patients having died from various causes unconnected with the operation of tenotomy. His investigations upon animal repair confirmed the account given by Paget of the development of new connective tissue, between the ends of the severed tendon, from a proper reparative
William Adams
1820-1900
material effused for the purpose and described as “nucleated blastema.”’ Paget believed the sheath played no part in the restoration whereas Adams considered it of primary importance in maintaining a direct connection between the divided ends of the tendon, and that “the new reparative material was infiltrated between the fibrous elements of the sheath which, therefore, at once formed the matrix for the newly formed tendon, and also determined its direction and definite form.” From the blastema a solid bond of union was formed between the ends of the tendon; it was tough, homogeneous rather than fibrous, and had a greyish translucent appearance which at once distinguished the new from the old tendon. The same process occurred in human beings except that the reparative material was formed more slowly and more sparingly just as callus was more abundant in bone repair in animals than in man.

Adams was constrained to inquire about the nature of repair of divided tendons, for tenotomy apart from manipulation was the only means of correcting deformity. Furthermore, subcutaneous cutting was all important; skin puncture admitted the minimum of air to the tissues. Many surgeons of the pre-antiseptic era were much concerned to keep air out of operation wounds for it was believed to have a mysterious property of promoting inflammation and suppuration, an evil, Hunter observed, from which subcutaneous surgery was free. Even Lister with complete knowledge still paid deference, with his carbolic spray, to the contaminating power of the air, nor indeed does a surgeon to-day feel that he can neglect such a menace, for the face mask and the meticulous care of the operating theatre, its corners and the manner of its ventilation, reveal an implicit fear of airborne infection.

The disability for which tenotomy was most frequently performed was club foot, a deformity which Adams studied exhaustively. In 1864 he was awarded the Jacksonian Prize of the Royal College of Surgeons for an essay on “Club Foot, its causes, pathology and treatment”; it was the result of a dozen years of careful observation and recording. The work was published as a monograph in 1866 and was much enlarged in the second edition of 1873. It was the most authoritative contribution on club foot since W. J. Little’s classic of 1839. A very interesting account is given of the history of tenotomy up to Stromeyer. As for the cause of deformity he rejected the mechanical theory of external pressure during intra-uterine life; he considered the disability as one of intrinsic origin and favoured Little’s view that the varus position of the foot was due to the spasmodic pull of certain muscles; but he did not attribute this abnormal muscle action to any organic disturbance of the central nervous system. Adams remarked upon the paucity of available pathological material for study yet he was able to dissect a number of young and adult specimens of the deformity and thereby contributed greatly to the better understanding of the pathology of club-foot. He was the first to report upon the microscopical examination of degenerated muscles involved in the deformity. With regard to the tarsal bones he found that “the os calcis and astragalus each occupy an oblique and, in severe cases, almost a vertical position . . . the astragalus is materially altered in form as well as in position; its neck passes obliquely inwards; and the articular surface of the head of this bone, instead of looking directly forwards, is turned towards the inner malleolus, and has therefore an antero-lateral aspect. . . . The navicular bone is displaced and drawn upwards and inwards, so far as to come in contact with the inner malleolus and holds a lateral relation with respect to the head and neck of the astragalus. . . . There appears to be sufficient evidence for believing that the malformed condition of the astragalus is determined by the malposition of two of the bones with which it articulates, viz., the navicular bone and the os calcis; and that its altered form is in evident adaptation to the altered position of these bones. . . . The astragalus in its cartilaginous state, having only an osseous centre, would mould itself during the latter part of its intra-uterine growth, to the lateral position of the navicular bone, and to the elevated position of the os calcis. The altered form of the astragalus, therefore, I regard as the result, rather than the cause, of the deformity. Cartilage has been, in my dissections, constantly found in those
portions of the articular surfaces of the astragalus which have either been extruded from, or may never have entered into, the composition of the ankle joint. . . . Cartilage has also, in every instance, been found on the exposed outer portion of the head of the astragalus. These facts sufficiently evince the tendency of the astragalus to develop itself in accordance with its normal typical form. The possibility of perfectly restoring the functions of the ankle joint, and the astragalo-navicular joints, is also proved, at least as far as the bones and their articular surfaces are concerned, if their normal relative position be restored at an early period. If this be accomplished we may consequently infer that the astragalus, during the subsequent period of its growth and ossification, will gradually assume its natural form. On the other hand, there can be little doubt that the difficulty of restoring the functions of the joints, into the composition of which the astragalus enters, would increase in direct proportion to the extent to which ossification of this bone has been allowed to proceed in the deformed position."

In the treatment of club foot he relied on manipulation and splinting alone or upon manipulation with tenotomy. If elevation of the os calcis continued the tendo Achillis was cut; also the tibialis anticus if inversion persisted. "But if, when the foot is everted by the pressure of the hand, the inner malleolus does not become sufficiently prominent, we must assume that the navicular bone is drawn towards the malleolus by the contraction of the tibialis posticus muscle and this tendon should also be divided." Occasionally the deltoid ligament was cut. Adams knew full well the intimate nature of all that impeded the correction of what was often a stubborn deformity. But he was only permitted to feel his way cautiously and work blindly in any attempt to sever tibialis posticus and deltoid ligament; his more fortunate successors at the same hospital, Elmslie, Trethowan and Brockman, were under no such restraint when boldly evolving the so-called soft-tissue operation. The splint he used as an aid to correction was the Scarpa shoe with ingenious improvements of his own. There was a metal calf trough to which was attached a steel bar proceeding along the inner side of the leg as far as the lower border of the heel, at which point it was fused, at a right angle, to a sole plate which itself was divided into two parts, opposite the transverse metatarsal joint, with a connecting metal strip bearing on its lower surface three joints individually controlled by a key. There were two similar joints interposed in the leg bar opposite the ankle. The leg and foot were bound to the splint by leather straps; a well-padded chamois leather skate strap passing across the front of the ankle kept the heel down on the sole plate. The controllable joints of the appliance enabled the foot to be dorsiflexed, plantar flexed, inverted or everted and the same variety of movement could be separately repeated at the transverse metatarsal joint with the addition of abduction or adduction of the forefoot. It was an admirable splint for its purpose but required daily skilled adjustment and was therefore essentially an appliance for in-patients. With the expansion of orthopaedic surgery and the introduction of open operative correction of deformities in general the pressure on beds increased, thus greatly reducing the number of patients who could be treated in hospital by splinting alone, and as the splint was unsuitable for an out-patient it gradually disappeared from use, but it lingered on at the Royal National Orthopaedic Hospital until the outbreak of the first world war.

The design of the splint and the placing of the two sets of joints were in conformity with his practice of dividing the treatment of club foot into two stages. The first stage was occupied in overcoming the inversion and adduction of the foot; when this was accomplished and the child was able to hold the foot in a straight line with the leg the second stage began with correction of the equinus element of the deformity and if necessary tenotomy of the tendo Achillis; but the fixation of the os calcis by this tendon was of great advantage in the first stage.

**Subcutaneous surgery**—Adams extended the application of subcutaneous surgery as widely as possible. He was the first in England to adopt this method as the routine procedure in the treatment of Dupuytren's contracture and of congenital wry-neck. He used a tenotome
with a small blade; in the hand he made multiple subcutaneous divisions of the palmar fascia and of its digital prolongations. The fingers were subsequently kept straight by his specially designed hand splint. In torticollis the tenotome was introduced just above the clavicle and the sternomastoid muscle cut from behind in a forward direction. The after-treatment consisted in stretching the neck in a head extension apparatus, the wearing of a hard felt jacket by day and a felt collar at night.

**Subcutaneous osteotomy**—Adams was perhaps the first to perform subcutaneous osteotomy in England—a type of operation introduced by Langenbeck in 1852—when by this method he corrected flexion ankylosis of the right hip joint in a man aged twenty-four years by cutting the neck of the femur. He had really planned to produce a pseudo-arthrosis but lacked a suitable cutting instrument capable of penetrating the skin through a tiny incision. After many trials on bones and hard woods a saw, small and strong with a wide double cutting edge carried at the end of a three-inch slender shank, was produced by Blaise. The operation was performed at the Great Northern Hospital on December 1, 1869. He "entered the tenotomy knife a little above the top of the great trochanter and carrying it straight down to the neck of the thigh bone divided the muscles and opened the capsular ligament freely. Withdrawing the knife I carried the small saw along the track made—preserving this by pressure of the finger—straight down to the bone and sawed through it from before backwards." Tenotomy of some contracted muscles was necessary before the hip could be completely straightened. A long interrupted Liston splint was applied to the limb. "In a fortnight I began to encourage motion but all attempts at movements were so painful that I gave up the idea and the result was bony ankylosis in a straight position with a good useful leg." This operation by Adams attracted widespread attention and was soon repeated by many surgeons. He himself adopted the same method in correcting malunited fractures of long bones and of severe rachitic deformities. Ogston and Macewen by subcutaneous cutting began to cure knock-knee; it was the procedure followed by F. J. Gant in his extra-articular subtrochanteric operation for flexion ankylosis of the hip which he first performed on December 10, 1872, when Adams was present.

**Spinal curvature**—Adams devoted much time to the study of spinal curvature in all its forms and particularly the pathology. He published a considerable volume on the subject in 1864 which was enlarged in the second edition of 1882. He remarked upon its preponderance in females and its frequency on the right side in the dorsal region. He divided the patients into three classes according to the pathology of their curvatures: physiological curves, commencing structural curves and confirmed structural curves. The first group exhibited no vertebral changes and were due to muscular weakness or faulty posture. In the second group the intervertebral cartilage only had suffered from unequal lateral pressure but with no vertebral changes. He laid great stress on the importance of being able to diagnose this class. The third group were those in which the intervertebral cartilages, the bodies of the vertebrae and the oblique articulating processes had all undergone structural changes and become adapted to the particular form of curvature produced by rotation of the bodies of the vertebrae.

He emphasized the fact that diagnostic signs carefully observed declared the nature of the underlying pathology. "It should always be borne in mind that the first evidence we have of any deviation in direction of the spinal column is not that of lateral curvature as judged of by any lateral deviation of the apices of the spinous processes; but the indications are those of horizontal rotation of the bodies of the vertebrae. According to my observation horizontal rotation of the bodies of the vertebrae always precedes lateral curvature, as indicated by the fixed lateral deviation of the apices of the spinous processes. . . . In the diagnosis of lateral curvature of the spine it is therefore a great fact, and one that should be strongly impressed on the mind, that we cannot rely exclusively upon the relative position of the apices of the spinous processes. . . . It is true that lateral deviation of the apices of the
spinous processes generally occurs both in slight and severe cases though not to an extent corresponding to the internal deviation of the bodies of the vertebrae. . . . When rotation of the bodies of the vertebrae has taken place, in however slight a degree, the patient cannot stoop in a direct line and at the same time preserve the symmetrical form of the back. If rotation of the bodies of the vertebrae has occurred the patient will always stoop in the oblique direction and the angles of the ribs will be observed to project posteriorly, and give a general prominence or fullness on the corresponding side; whilst on the opposite side a flattening—in slight cases not amounting to a depression—will be observed. The spine will also bend or curve forwards with less regularity through the region affected so that it appears less flexible at this part and remains straighter. These indications, when present, will form a valuable aid to the diagnosis of internal curvature in an early stage.” With regard to treatment he relied upon a combination of partial recumbency, gymnastic exercises and mechanical support together with improvement of the general health by nutrition and medical means. The physiological curve was straightened without mechanical support. The second class of curve often required an appliance and sometimes a cure was achieved. The third class with severe curvature and well-established changes in the vertebrae was incurable. These patients might be improved but they were dependent upon mechanical support to prevent regression. The final model of spinal support, designed by Adams, and made by Ernst of light well-tempered steel, with arm crutches, adjustable spring plates over the rotated ribs, and fitting comfortably, is still unsurpassed after more than seventy years since its emergence.

**Congenital dislocation of the hip**—Adams was familiar with congenital dislocation of the hip. At the Section of Surgery at the annual meeting of the British Medical Association held in Cardiff in 1885 he opened a discussion on this disorder based on an experience of sixty patients, all of whom he had carefully studied; forty-seven were females and thirteen males; forty-one unilateral and nineteen bilateral. He regarded it as essentially a defect of the acetabulum. During the discussion Professor Bennett of Dublin exhibited a dissected pelvis of a girl aged six years with congenital dislocation of both hips. Adams had been able to reduce the dislocation in some patients by gradual traction, a method that Buckminster Brown had revived after it had been discarded since its introduction by Pravaz in 1838. Traction receded again upon Paci’s dramatic demonstration of manipulative reduction in 1894 only to be revived in another form, by means of the abduction frame, during this last decade. Adams, however, failed to maintain the reduction of the dislocation until stability was established and was therefore disposed to regard the disorder as incurable.

Adams practised at No. 5 Henrietta Street, Cavendish Square, where now stands the Royal College of Nursing. In 1889 he delivered the Lettsomian Lectures on Rheumatic and Strumous Diseases of the Joints. In 1876 he was elected President of the Medical Society of London and in September of the same year he, Lauder Brunton and Richard Davy represented the Society at the International Medical Congress at Philadelphia at which he read a paper on his subcutaneous operation for dividing the neck of the femur. With Lister he watched Sayre excise the hip joint in a boy aged about ten years. The Cunarder Scythia took ten days on the outward passage in calm weather. Adams and his colleagues were loud in their praise of the reception and unbounded hospitality they received in America. He himself in private was hospitable, genial, humorous, a great talker with a soft voice and well-marked lisp. In 1895 he was elected an honorary member of the American Orthopaedic Association. The following year he retired from practice and went to live at No. 7 London Road, St John’s Wood. He had married Mary Ann Mills in 1847 and had two sons and a daughter. He died on February 3, 1900, soon after his eightieth birthday.

William Adams was the best-known orthopaedic surgeon of his time in England. He came to the Royal Orthopaedic Hospital on the heels of W. J. Little who virtually trained him. He held the advantage over his teacher in that he was solely devoted to surgery and was a well-disciplined pathologist of great experience. It is doubtful whether there ever was
an orthopaedic surgeon better equipped to probe the problem of deformity on a scientific basis. With great energy he investigated the whole field of deformity and wrote more extensively upon it than anyone else; what he wrote bears the impress of first-hand knowledge and research. In interpreting his clinical observations he sought as far as possible to ascertain the underlying pathology, often comparing them with the clinical signs of a known morbid anatomy. He was particularly free from prejudices and his judgments were well balanced. Early in his career he lectured regularly on orthopaedic surgery and advocated a greater diffusion of its knowledge by the establishment of wards in general hospitals for this special branch of surgery. No one contributed more than William Adams to the advancement of orthopaedic surgery in the last century. His passing closed an epoch; it was the end of the tenotomy period, for he was older than Lister and never saw antiseptic surgery in its perfection.

ARTHUR ROCYN JONES.

We are grateful to the Royal National Orthopaedic Hospital for permission to reproduce the portrait of William Adams.

REFERENCES

Lancet (1900): I, 812.