



## William Dall - A Dental Research Pioneer

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WILLIAM DALL was born in Burntisland, Fife in 1855. His dental education commenced in a very normal manner. As a youngster in busy dental practices first in Cupar, Fife and then in Edinburgh, his willingness to carry out menial tasks would single him out as worthy of encouragement and deserving of the accolade of indenture as an apprentice. This agreement between his father or guardian and an established dental practitioner ensured that in return for a sum of money paid to the dentist, the latter would guarantee to provide a practical training in the laboratory techniques of the dental practice. Expertise in manual laboratory techniques was the most important training of a dentist in the early part of the nineteenth century. Gradually however surgical techniques were being refined and the brute force of the blacksmith, barber surgeon or show ground charlatan was being replaced by an approach in which dimly perceived principles of anatomical structure, physiological function and disease were combining to introduce a clinical approach to the dental problems presented by the patient.

Although there was no Dental School in Scotland at this time, Dr John Smith an Edinburgh surgeon had been providing a course of lectures on the Physiology and Diseases of the Teeth since 1856. Anaesthesia by nitrous oxide, ether or chloroform became increasingly available in many dental practices but could not be said to be in common use. Amalgam and cement filling materials were being developed but gold was recognised as the superior substance for restorative procedures. The trouble was that the removal of decay from a cavity was seldom adequate and the filling seldom arrested the process of decay. A 'marvellous' discovery appeared during the period of William Dall's apprenticeship, the Morrison dental foot engine became commercially available. The accuracy with which the dentist could now prepare a cavity was improved immensely by the dental bur in a handpiece and there is no doubt that Dall was fascinated by this discovery. His early training was followed by periods as an assistant in some well known practices in different parts of the country. His first post was as an assistant to Walter Campbell in Dundee, a practice in which successive members of the family earned an outstanding reputation over a period of many years. For the next two years he served as an assistant to John Stirling in Ayr followed by a period with W D Woodburn in Glasgow, another family practice which later contributed members of staff to Glasgow Dental Hospital during the early part of this century.

While he had been completing his training as a dental surgeon moves were afoot to establish a dental hospital and school in Glasgow as a consequence of an Act of Parliament, the main object of which was the registration of dentists. Dall now decided to set up in practice on his own account and is first registered as being in practice at 51 Great Western Road. In 1881, although there is no record of him having been a student at a dental school, he sat the examination at the Royal Faculty of Physicians and Surgeons, Glasgow and gained the Licence in Dental Surgery. He then purchased the

practice of John Crooks Morrison at 341 Bath Crescent, the first lecturer in dental anatomy and physiology at the 'new ' Glasgow Dental Hospital and School, who died tragically from typhus at an early age in his career. Dall later moved to 4 Newton Terrace where he remained until 1893.

Dall's first lecture to the West of Scotland branch of the British Dental Association was on the 28th February 1889 and dealt with Porcelain Fillings, Plain and Gum Coloured. Dall confessed in this lecture that he started trying to use porcelain as a filling material in 1886 but abandoned it because of the unsatisfactory results he obtained using fused porcelain fillings or inlays supplied by the dental depots. These were neither of the proper shape nor delicate enough in shade of colour. His patients however disagreed and continued to request more work of this nature with the result that he decided to persevere and improve his methods. Dall was certainly strongly opposed to the use of amalgam or gold where the material was normally visible.

"... People are becoming more artistic, he said and, "...we are more and more asked to keep the gold out of sight." He felt that British dentists were drifting into the same error as American dentists in the excessive use of gold merely on account of its value. Thus began a career in which he became the foremost exponent of ground porcelain inlays of his day. He developed and demonstrated techniques which facilitated and improved every aspect of porcelain inlay work and recommended its use for practically every restorative procedure. "Some dentists use porcelain only in exceptional circumstances; with me it is the exception where it cannot be used."

Dall patented many of his ideas and was remarkably successful in obtaining commercial support for their marketing. Claudius Ash and Sons Ltd. was the principal dental manufacturer to market ground porcelain inlay kits and many of the modified dental instruments which appeared under Dall's name. This close relationship between the dental research worker and a commercial concern is the acme of success in the present day world of cash strapped research resources and it is interesting to note how successful Dall was in his day without a formal dental education or scientific training in research methods.

Much of Dall's success was due to meticulous attention to detail and his willingness to address meetings and provide demonstrations throughout this country and abroad. He advised that the porcelain of which Ash teeth were composed was finer and capable of a much superior final polish than others. Where a cavity involved part of the root surface of a tooth which would normally be covered by gum, Dall advocated the use of pink shaded porcelain. He also recommended that vulcanite dentures have pink porcelain gum work continuous with the teeth giving a superior result to the normal pink rubber facing.

Although he used S. S. White diamond discs and burs he lectured on the differences between South African diamond grit and that from Brazil and described how double-sided and safe-sided copper discs mounted in an engine handpiece mandrill could be manufactured by the dentist in his practice. In Dall's time, every dental workshop had a furnace in which porcelain could be fused and a vital piece of equipment was the muffle within which the porcelain would be placed to shield it from the fumes or dust of the furnace, Dall lectured on the best designs and material for the construction of such muffles and exhibited many which he had produced and patented.

The essence of Dall's approach to ground porcelain inlays was that the dentist could keep at the chair side a large selection of inlays in a variety of shapes and sizes and each of these in a variety of shades. He visualised selection of at least five hundred varieties. A gauge is used to match the standard inlay sizes to a series of fine inlay burs which were used at the final stage of cavity preparation to regularise the outline of the cavity and make it match one of the standard gauge sizes. The appropriately sized inlay will now be found to be a tight fit in the finished cavity and can then be cemented in place and the surface polished. The variations on this theme are, however infinite such as the variety where the hidden lingual part of a large mesial or distal cavity in an anterior tooth is plugged with cohesive gold foil leaving a cavity on the labial surface for the insertion of a porcelain inlay. Dall's lack of knowledge of the histology of tooth enamel resulted in many examples of cavity design which left unsupported enamel prisms around the margins of his inlays.

While there is evidence that Dall's porcelain inlay techniques were followed by contemporary practitioners there is little evidence that his method of preventing upper and lower dentures from slipping forward received serious consideration. He recommended that dentures be constructed with gold posts of pivot wire extending from the fitting surface into deep holes in the alveolar process which have been previous root sockets or have been specially drilled in the bone. He advised that these holes be drilled between the mental foramen and the symphysis in the lower jaw and anywhere that avoids perforation in the upper jaw, preferably in the canine or first premolar region.

Although he admitted that colleagues "... more versed in bacteriology and osteology" might be afraid of the serious consequences of the procedure if practised by careless operators, he claimed to have completed fifty cases with continued satisfactory results after a five year period and that in only one case did suppuration result through 'the patient catching cold.'

In 1904 at the age of 48, hard work took its toll of his health and he was advised to adopt a less strenuous lifestyle. He sold his practice and travelled half-way round the world to the west. After a short stay on his return to the U.K. he was on the move again travelling half-way round the world in an easterly direction returning from Vladivostock to Moscow by the Trans-Siberian railway. His enquiring mind continued even in these circumstances to accumulate further examples of inlay work and his lectures and textbook show examples of inlay techniques from Honduras, Central America and India.

On his return to Glasgow in 1909 to set up practice at 6 Clarence Terrace, he devoted himself more fully to further research into inlay techniques. By 1911 he had compiled a textbook presenting his methods to the profession and so well illustrated, that those interested in ground inlay porcelain work would find little difficulty in following the meaning of the text. Unforeseen circumstances and the war years were to delay publication and it was not until after his death in 1932 that his widow managed with the help of Mrs Lilian Lindsay and Sir Frank Colyer to have his work published.

In 1927 he sold his practice in Glasgow to Dr Charles Read, the eminent dental radiologist and retired to Stirling intending to devote his time entirely to dental research. He equipped a fine laboratory at 7a Park Avenue, Stirling but died on 8th April 1932 at the age of 76 without ever being able to use it. Generous bequests to the three Scottish dental schools resulted in prize medals at Edinburgh and Dundee for expertise in laboratory and porcelain techniques and a research fund at Glasgow.

William Dall was much more than a dental technician and operator. He was an innovator and a dedicated teacher who felt compelled to communicate to others the techniques which he found to be of advantage in his work. Modern equipment and materials have superseded his methods but the painstaking attention to detail which he advocated continues to inspire the best results in laboratory and chair-side techniques.

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