

MANAGING DECAY: FROM EXTRACTIONS TO PREVENTION

Dental care, like medical care, has evolved over time. It is fair to say that, until the turn of the 20th century, the predominating form of treatment of dental disease (the most common being dental decay) was the removal (extraction) of teeth. In fact, with the advent of local anaesthesia (together with improved materials to make dentures), tooth removal, while certainly destructive, was an easy way to enable people to eat and chew food and also present an acceptable smile, without unattractive cavities in their front teeth. This approach to care became very popular, and there are stories from the early 20th century of young women about to marry having all their teeth removed, to be replaced by dentures paid for by their parents, to avoid the new husband having to devote precious funds to expensive dental care. Similarly, full dentures (preceded by removal of all teeth) became a popular 21st-birthday gift.

During World War I, the armed forces recognised that replacing the teeth with full dentures was the most efficient way to render fighting men 'dentally fit'. Fortunately, with better understanding of disease processes and the rapid development of dental materials, repairing the effects of dental decay became the treatment of choice, followed by prevention of disease initiation.

For almost 100 years the 'repair' (restoration) of teeth affected by dental decay (caries) was dominated by the teachings of Dr GV Black (1835–1915), as embodied in his 1908 text *A work on operative dentistry in two volumes*. The dentist would remove the decay and place a restoration ('filling') of dental amalgam, which was the main material used at the time, and is still in use today. This is an alloy of mainly mercury, silver and tin; it does not adhere to the tooth, and therefore sound tooth structure needs to be removed in order to 'lock' the amalgam in place. In addition, Black taught the principle of 'extension for prevention', which essentially meant that the dentist would prepare the cavity to receive the amalgam by removing any tooth structure that might, Black believed, decay in the future, and extending the cavity into areas of the tooth that Black believed were 'immune' to future decay. The result of Black's teaching was that the tooth became weakened and prone to future fracture.



Cat. 132 Charles Harold Down (1890–1965), **Molar models in case: *The commencement & progress of tooth decay***, c. 1930, wax, paint, paper, ink, wood, glass; 40.0 × 50.5 × 6.0 cm. HFADM 2574, gift of the Australian College of Dentistry 1963, Henry Forman Atkinson Dental Museum, University of Melbourne.

Black's principles for preparing cavities and removing caries were used to treat all decay, whether the tooth showed only early signs of decay (manifested by a 'chalky' appearance of the enamel surface), or the decay had progressed to a cavity. The belief was that caries inevitably progressed from the first clinical signs (the chalky white spot) to a frank cavity, and that the driving force behind progression of decay was bacteria deep in the tooth, forming acids that dissolved the tooth substance at the advancing front of the cavity.

We now know that it is possible to halt the progression and heal or re-mineralise chalky enamel, thus avoiding the need for a restoration. This non-surgical approach for managing 'white spots' has become possible through our better understanding of the caries process and our greater awareness of the importance of detecting the early signs, to enable early intervention with preventive measures to halt or arrest the progression of decay. While research published from the 1950s to 1970s had shown that a clean tooth did not decay, and that for many people increased ingestion of sugars resulted in increased caries, we now know that progression of decay occurs when the effect of enamel-dissolving acids formed by the interaction between plaque (the bacterial film that forms on the tooth surface) and dietary sugars outweighs the decay-protective effects of saliva. Furthermore, it has been demonstrated that the decay can be controlled if that interaction in the plaque on the surface of the lesion is controlled, rather than needing to remove bacteria deep inside the cavity. Simply cleaning the plaque consistently from the early decay on the tooth surface, and consuming less sugar, have been shown to arrest the progression of early decay. In addition, exposure to fluoride in vehicles such as community water supplies, toothpastes and mouth-rinses helps to arrest decay, and in many cases increases the mineral content of the tooth surface. Calcium phosphopeptide-amorphous calcium phosphate (CPP-ACP), developed from cows' milk over the last several years at Melbourne Dental School, has also been shown to re-mineralise early enamel decay.

Hence, management of decay today consists of a patient-centred approach tailored to the individual, rather than a one-size-fits-all approach. Emphasis is placed on minimally invasive management of decay, with early non-surgical intervention to arrest and

'Maximum comfort and convenience at minimum cost', advertisement published in Cat. 154: Dental Students' Society, *The Dental Follies 1946*, Melbourne: Ramsay, Ware Publishing Pty Ltd, 1946, booklet: print on paper, 21.5 x 13.8 cm. HFADM 3336, gift of Kerry, Sally and Michael Landman 2018, Henry Forman Atkinson Dental Museum, University of Melbourne.



Sterling
SINGLE CYLINDER
DENTAL CHAIR

MAXIMUM COMFORT and **CONVENIENCE** at minimum cost

Sterling
SINGLE CYLINDER

DENTAL CHAIR

Made in England—
unequaled for value

ORDER FROM YOUR
USUAL DENTAL DEALER

Modern design and adaptability that readily ensure complete comfort for all types of patients.

All movements smooth working, quiet and efficient and all adjustments quickly made without effort.

Counterbalancing movement that offsets weight of chair-back and patient; self-conforming back-rest and extra long foot-rest.

High quality materials; British craftsmanship; choice of five finishes; bright metal parts chromium-plated.

Illustrated folder giving detailed information free on request

Sole Wholesale Distributors:
THE AMALGAMATED DENTAL COMPANY, LIMITED (INCORPORATED LONDON, ENGLAND),
124 Exhibition Street, MELBOURNE, and at 160 Castlereagh Street, SYDNEY

re-mineralise early decay, and minimally invasive tooth preparation for decay that does require a filling. Major developments in restorative materials in the past 20 years have made it possible to reliably ‘stick’ tooth-coloured materials (for example, ‘composites’) to the tooth structure; thus for cavitated lesions the dentist has to do little more than remove the caries and place the restoration. Furthermore, GV Black’s concept of ‘extension for prevention’ has been challenged, so cavities prepared to accommodate the restoration are substantially smaller than was recommended by GV Black for amalgam. Finally, whereas Black taught that all caries must be removed before placing the restoration, clinical evidence demonstrates that caries can remain, and provided that it is ‘sealed’ in, decay will not progress. As a consequence, there has been a steady decline in the use of amalgam, and an increase in the use of composite and other tooth-coloured adhesive materials.

Concurrent with these developments, two other factors have contributed to the increased use of tooth-coloured materials. Firstly, the grey or silver colour of amalgam is often unacceptable to patients, and consequently there is an increasing demand for ‘white’ fillings. Secondly, amalgam as a material is coming under scrutiny because of the environmental problems of mercury, and although the contribution of mercury to the environment from dentistry is estimated to be a few per cent, it is seen to be socially responsible to minimise the use of mercury-containing materials and to recycle as much amalgam as possible. In 2013, the United Nations Environment Program published the Minamata Convention, aimed at phasing down the use of dental amalgam, and phasing out the use of most other mercury and mercury-containing products and processes.

It is likely that, as the delivery of dental care evolves, so too will individual treatment services. It is possible that people reading these words in the future will puzzle over our emphases in 2020, and perhaps over our attitudes to interventions. However, we predict that future services will for the most part become less interventional and more reversible. Certainly, the current trend for caries treatment in this regard should continue. If a future reader identifies that this is not the case, then we suggest that dental care will not have evolved to the enlightened position that we believe it should.

Professor Mike Morgan, Professor Martin J Tyas AM and Dr Margaret A Stacey