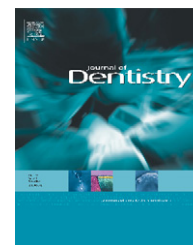


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Ten-year outcome of crowns placed within the General Dental Services in England and Wales

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ARTICLE INFO

Article history:

Received 5 June 2007

Received in revised form

27 March 2008

Accepted 29 March 2008

Keywords:

Porcelain

Crowns

Metal-ceramic

All-metal

Survival

General Dental Services

ABSTRACT

Aim: It is the aim of this paper to consider the factors associated with the need for re-intervention on a crown, and the times to re-intervention.

Methods: A data set was established consisting of patients, 18 years or older, whose birthdays were included within a set of a randomly selected dates, one of which was chosen in each possible year of birth and whose restoration records contained the placement of one or more indirect restorations on courses of treatment with last date on the claim form after 31st December 1990, and with date of acceptance after September 1990 and before January 2002. For each tooth treated with a crown, the subsequent history of intervention on that tooth was consulted, and the next date of intervention, if any could be found in the extended data set, was obtained. Thus, a data set was created of crowns which have been placed, with their dates of placement and their dates, if any, of re-intervention.

Results: Data for over 80,000 different adult patients were analysed, of whom 46% were male and 54% female. A total of 47,474 crown restoration occasions were obtained from the data over a period of 11 years.

Metal crowns were found to have the longest survival—68% at 10 years, and all-porcelain crowns the shortest—48% at 10 years. Factors which were found to influence outcome of crowns included type of crown, age of patient, patient payment exemption status, patient attendance pattern and placement of a root filling in the same course of treatment as a crown.

Conclusions: Full-coverage all-metal crowns have longer survival times before re-intervention than metal-ceramic crowns and all-ceramic crowns. Root fillings are associated with reduced survival time of the crowns examined in this study.

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1. Introduction

1.1. Crowns in the General Dental Services

While direct placement restorations comprise the largest volume of restorations placed within the National Health Service (NHS) General Dental Services (GDS) in England and Wales,¹ there is, nevertheless, a substantial number of crowns

placed in any given year within the GDS (Tables 1 and 2),¹ with these amounting to a total spend of £117.5 million in the year ending March 2005.¹ This study examined the recorded intervals between placing a crown and re-intervention on the same tooth, this being obtained from a large representative sample of patients treated in the GDS of England and Wales between 1991 and 2001, full details of which have already been published.^{2,3} The data consist of items obtained

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doi:10.1016/j.jdent.2008.03.017

Table 1 – Number of crowns, including all types, placed per annum for adults within the GDS in England and Wales

Year	Number of crowns
2000/2001	1,239,952
2001/2002	1,246,014
2002/2003	1,427,055
2003/2004	1,350,869
2004/2005	1,131,590

The reductions in 2003/2004 and 2004/2005 may be due to dentists transferring from GDS to PDS, but figures for crowns placed under PDS Regulations are not available.

Table 2 – Number of crowns of different types placed in the year to end of March 2005 for adults within the GDS in England and Wales

Type of crown and GDS item number	Number of crowns
1711: Full or 3/4 in precious metal	298,652
1712: Jacket in non-precious metal alloy	31,787
1716: Porcelain jacket	16,152
1721: Bonded metal/porcelain full crown in gold alloy	653,090
1722: Bonded metal/porcelain full crown in non-precious alloy	130,159
Bonded metal/porcelain full crown in platinum alloy	847
Synthetic resin full crown	903
Total	1,131,590

from the payment claims submitted by GDS dentists to the Dental Practice Board (DPB) in Eastbourne, Sussex, UK, now known as the NHS Business Services Authority (Dental Services Division). Regulations pertaining to the materials utilized in the construction of the restorations changed during the duration of this study, but, notwithstanding the exact constituents of the metal in metal-containing restorations, three principal groups of crowns dominate the data, namely, all-metal crowns, metal-ceramic crowns and all-ceramic crowns.

1.2. Assessing outcome

The interval between successive interventions is a statistical proxy for the 'life' of a restoration, but it must be recognized that there are many other measures in use in the world of dental research.

The start of the life of a restoration is well defined as a point of time, when the restoration is actually placed on the tooth. This date is not explicitly recorded in the administrative records provided to the DPB. In this project, the date of restoration placement was taken to be the last date recorded in the payment claim in respect of the course of treatment. In most cases this is the date of completion, when the dentist discharged the patient at the end of the course of treatment. In this regard, it could be considered that the date of placement of a crown would be close to the date of completion of treatment, since crowns are generally not placed until the

remainder of a patient's mouth has been rendered dentally fit. The end of the life of a restoration is conceptually more difficult, and it also strays into the issue of censoring, which was discussed in a previous article.²

In this paper, the definition of the end of the life of a crown was taken to be the date of acceptance for the next course of treatment in which the tooth received an intervention other than maintenance, such as is defined in the Regulations as "stoning and smoothing".

Re-intervention on a previously restored tooth has been considered to be associated with the original restoration,⁴ but it is nevertheless possible that there is no causal connection—the re-intervention may have been required in response to a circumstance not related to the original restoration. However, it could be considered that this is less likely to be the case with crowns than with other restorations, given the fact that crowns generally cover most of the surface of the tooth.

1.3. Success rates of crowns

Clinical performance of crowns has been assessed by a variety of methods, although, perhaps surprisingly, the literature on bridges is more voluminous than for individual crowns. In this respect, it is of relevance to note that Goodacre et al. could find only eight studies, from a total of 163 papers in their literature review on complications in fixed prosthodontics, that reported incidence data on crowns which were not bridge retainers.⁵

Van Nieuwenhuysen et al.⁶ evaluated the outcome of extensive restorations in posterior teeth in a prospective, longitudinal study, calculating a median survival time of 14.6 years for crowns using Kaplan-Meier statistical methodology, compared with 12.8 years for large amalgam restorations, and finding that restoration survival was influenced by extension of the restoration, age of patient, pulpal vitality and use of pins.

Goodacre et al. have recently reported the complications associated with fixed prosthodontics using a variety of searching methods.⁵ A total of 1476 single crowns were identified in 8 studies and a total of 157 (11%) were associated with some type of complication. The three most common complications were need for endodontic treatment (3%), porcelain veneer fracture (3%) and loss of retention (2%). However, there was found to be little standardization of the reporting of complications, although the data indicated "generally good" performance of single crowns.

Several studies have reported the performance of gold crowns. Leempoel et al. observed crowns and partial crowns for a period of up to 11 years, with the results, presented in 1985, indicating survival rates of 91% for partial gold crowns at 11 years and 97% for full gold crowns.⁷ Haas et al. assessed the performance of gold crowns, with the results indicating 91% success after 10 years.⁸ Cross sectional studies have estimated annual failure rates, with the results again indicating good performance of gold crowns.⁹

It is the purpose of this paper to examine the time to re-intervention of teeth with crowns which have been placed within the GDS Regulations and present a detailed analysis of the factors which may influence this. Another paper will assess the restorations which are placed when a re-intervention is considered necessary.

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