The clinical performance of two groups of functioning class-II cast gold inlays

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The length of service and the clinical performance of two groups of functioning class-II cast gold inlays in patients attending a private practice were assessed by conventional clinical and radiographic examination. In one group all inlays were older than 25 years (median age, 34 years), and they had an extended outline form. The impression technique was based on a thermoplastic material in a copper ring. In the other group, comprising inlays inserted during the past 25 years (median age, 16.5 years), the outline form was minimal and an elastic impression material in a copper ring was used. The inlays in the older group appeared to perform better than those in the younger group. In both groups recurrent caries appeared to be the predominant reason for repair. □ *Cast restorations; functioning inlays; performance*

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Dental practitioners usually consider cast gold inlays to be the most favorable alternative in the conservative treatment of class-II carious lesions. However, surveys on the performance of gold inlays are rather limited, and the data available do not support the expectations. Thus, Allan (1) concluded that few class-II gold inlays survived 15 years. Actually, the durability of class-II amalgam restorations was at least as long as that of gold inlays in his study. Discouraging results for gold inlays have also been reported by Crabb (2), who indicated that only 42% survived 10 years, which was slightly less than that of amalgam restorations. Similar results have been obtained in Eastern Europe (3). Moore & Stewart (4) found that 31.4% of 436 inlays were defective. Nevertheless, the gold restorations enjoyed a higher level of success than restorations in other filling materials. Bentley & Drake (5) came to a similar conclusion and found that over 90% of cast restorations survived for 10 years. Mjör et al. (6) reported data that indicated a median age of 13 years for functioning MOD gold inlays. It has been claimed that recurrent caries is encountered frequently at the margins of cast gold restorations (7) and that this caries progresses rapidly (8). Presern & Strub (9) and Goto (10) also demonstrated an alarmingly high frequency (up to 43%) of recurrent caries associated with class-II gold inlays.

The aim of the present survey was to assess the length of service and the clinical performance of two groups of functioning class-II cast gold restorations in patients attending a private practice.

Materials and methods

Sixty patients (39 women and 21 men) in the age group 36–75 years, having 187 functioning class-II cast gold inlays (480 surfaces), were included in the survey. The patients had been attending the same practice for up to 40 years, and six dentists had been involved in the treatment of these patients during the period. All patients had been selected for gold inlay therapy on the basis of a low caries prevalence.

The patients were divided into two groups. This was done because some important changes took place in the practice 25 years ago. First, the dentist who had made most of the inlays until then limited his practice

to fixed bridge work and removable prosthodontics, and younger dentists took over the conservative treatment of the patients. These dentists adopted newer impression techniques (elastic materials) and had a different view with regard to the outline form of the cavities. In particular, they reduced the buccolingual extension of the approximal preparation.

The teeth were dried thoroughly, and any concrements removed. By means of a sharp probe and bitewing radiograms the restorations were examined for wear (including also the adjacent tooth structure), secondary caries, repair, and marginal adaptation and integrity. To be classified as 'flawless', the restored surface had to exhibit no recurrent caries, no repair, no overhang, no gap, and no extensive wear producing a step or gap between the cavity margin and the restoration. Four hundred and eighty surfaces were examined at recall by the same dentist. Information on the length of service and any history of recementation and causes of repair were obtained from the dental records.

Table 1. Performance of two groups (A, B) of functioning class-II cast gold inlays

	A	B
Period of service (years)	25→41	2→25
Median age (years)	34*	16.5*
Total no. of inlays	127	60
Total no. of surfaces	310	170
Repaired surfaces due to		
Recurrent caries, *n*	24	49
Wear of tooth substance at the occlusal margins, *n*	8	2
Unacceptable wear of tooth substance at the occlusal margins, *n*	4	1
Remaining gingival overhangs, *n*	18	7
No. of flawless inlays	110	43
No. of flawless surfaces		
Total no.	256	111
%	83‡	65†

* The median age of all the restorations was 28.5 years.
† One inlay (three surfaces) recemented.
‡ One inlay (three surfaces) recemented.

Results

Of the 187 inlays (480 surfaces) examined, 127 (68%, 310 surfaces in 29 patients) had been in service for more than 25 years (median age, 34 years), some of them being around 40 years (Table 1). One hundred and ten of the inlays (83% of the surfaces) in this group were clinically flawless. Thirty-two surfaces had been repaired at the restoration margin, mainly due to secondary caries, whereas four showed unacceptable wear of occlusal tooth substance resulting in a step at the margins of the inlay. Eighteen surfaces showed gingival marginal overhang. One inlay had been recemented.

In the group of restorations in service for less than 25 years (60 inlays; 170 surfaces in 31 patients; median age, 16.5 years) 43 inlays (65% of the surfaces) were flawless. In total, 51 surfaces in this group had been repaired, whereas 1 (occlusal) showed an unacceptable step at the margin due to wear of the adjacent tooth surface. Twenty-nine of the 49 surfaces that had been repaired owing to recurrent caries had a history of gingival marginal overhang before the carious attack. In this group too, one inlay had been recemented.

Discussion

The general practitioners' attitude towards the use of cast gold inlays appears to be based mainly on their own clinical experience and on case reports. The data obtained in the present survey show that class-II cast gold restorations *may*, under favorable conditions of production and maintenance, achieve a significantly longer durability than is indicated by previous investigations (1–6). According to these investigations, the estimated median durability for gold inlays seems to be 10–15 years. The data from these reported studies are not, however, directly comparable with those from the present survey, since the patients examined here did not represent all those who received gold inlay therapy during the 40-year period. Because the time period was quite long, some of the earliest patients were deceased, and others had moved. Only those who

showed up at regular recall were included. This will of course limit the conclusions that can be drawn from the study.

There was a difference in success rate between the two groups in the present study, the one containing the restorations with the longest duration being the most successful. The explanation of this difference may be numerous. One aspect may be related to the skill of the dentists in the practice; another may have to do with modifications of cavity preparation and the introduction of new impression materials. The restorations in the older group were performed on rather extended preparations, using a thermoplastic impression material (Kerr, Green Impression Co., Type 1) in a copper ring. Extended preparations facilitate the attainment of correct impressions and might actually have been a prerequisite for the use of the thermoplastic material. In the restorations in the younger group the outline form was of clearly less extension, particularly in the approximal areas. It represented a minimized Crawford type (11). This condition, combined with the use of an elastic impression material (mostly H.R. Synchron) in a copper ring, a combination that may not constitute the method of choice when dealing with natural undercuts along the outline form, may offer another explanation. Such natural undercuts regularly exist adjacent to inlay preparations of the minimized Crawford type, particularly along the mesiobuccal and distobuccal cavity margins. A copper ring extended over these margins may easily be distorted on withdrawal of the impression.

The patients in the two groups had been selected on the same basis with regard to socioeconomic status, caries prevalence, and oral hygiene, all of which are considered factors relevant for the longevity of restorations (6, 12–16). Thus, all patients were in a 'low caries risk' category. Nevertheless, recurrent caries appeared to be the predominant cause of repair of the gold inlays, particularly in the group with the lower median age. In this group 29% of the surfaces had been attacked by recurrent caries, with a preceding history of gingival marginal overhang, as compared with 8% in the group with higher median age. These data are comparable to those reported by Sobkowiak & Teseler (17) but are somewhat lower than those obtained from one of Presern & Strub's groups (9). In the present study it appeared that a minimally extended outline form, combined with a copper ring /elastic material impression technique produced conditions predisposing to recurrent caries. The possibility exists, however, that more of the older patients developing recurrent caries had been gradually sorted out from the inlay group during the years by replacement therapy than was the case in the younger patients. Thus, the possibility cannot be ruled out that a further 'selection' of patients may have occurred to some extent. Nevertheless, the results of the present survey clearly demonstrate the potential of gold inlay therapy under optimal conditions. There is, however, reason to advise against the use of elastic impression materials in a copper ring when dealing with minimally extended approximal cavities.

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