remained the primary choice most notably in Nigeria, Jordan, and the United Kingdom, whereas composite was selected most often in Australia, Iceland, and Scandinavia.

Reasons for Initial Placement

The original review listed primary caries and non-carious defects as the most common reasons for initially placing a restoration. For primary caries, amalgam was used 55% to 100% of the time and resin composite 38% to 100% of the time. For non-carious defects, amalgam was selected 0 to 13% of the time, whereas resin composite was selected 0 to 59.1% of the time. Just 4 papers reported the use of glass-ionomer/modified glass-ionomer. It was most often selected to manage non-carious defects, followed by primary caries.

For the later review, primary caries prompted placement of an initial restoration in 48.8% to 100% of cases. Non-carious defects were the reason for placement in 0 to 29.9% of cases.

Reasons for Replacement

The original review cited the reason for replacing amalgam restorations as secondary caries in 25% to 67% of cases and as bulk/marginal fracture in 15% to 45% of cases. Resin composite restorations were replaced for secondary caries in 20% to 44% of cases, for bulk/marginal discoloration in 13% to 37% of cases, and for poor anatomic form in 0 to 40% of cases.

In the post-1998 review, just 9 of the 13 new papers gave reasons for replacing different restorations. Amalgam restorations were replaced for secondary caries in 28.5% to 57% of cases, for bulk/marginal fracture in 11.5% to 29% of cases, and for tooth fracture for 0 to 24% of cases. Resin composite restorations were replaced for secondary caries in 29% to 59% of cases, for bulk/marginal fracture in 9.1% to 38% of cases, and for bulk/marginal discoloration in 0 to 18.2% of cases.

DISCUSSION

Restoration replacement procedures continue to form the major part of the routine work of dentists. Secondary caries remains the primary cause for replacement. The use of amalgam has declined significantly, while the use of resin composite has increased.

Clinical Significance

The continuing reliance on replacement rather than repair of restorations is a concern because replacement continues the downward spiral of a tooth by progressively eliminating tooth structure. Repair is more likely to conserve tooth structure and the longevity of the tooth and its restoration. Research is needed to determine how the outcomes of repair compare to the outcomes of replacement with the hope that an evidence-based decision can be made to support repair and relegate replacement to the category of a last resort.

Eltahlah D, Lynch CD, Chadwick BL, et al: An update on the reasons for placement and replacement of direct restorations. *J Dent* 72:1-7, 2018

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Survival of amalgam restorations

BACKGROUND

Survival of restorations is an important consideration that dentists should be aware of so that they can share the information with the patient before a course of treatment is begun. In addition to the patient and dentist, third-party payers, epidemiologists, government agencies, and other interested parties may value such information because it has an impact on the decision to invest in a restoration. Amalgam restorations were common in the past and still are done, although concerns are leading to an abandonment of amalgam as a restoration material. The survival of amalgam restorations overall and with respect to various patient, dentist, and clinical factors was evaluated in the light of the time to reintervention and the time to extraction of the teeth that were restored.

METHODS

The data on 25 million courses of treatment over the course of 15 years and including 3 million dental patients were released to the research community by the United Kingdom Data Service. The information came from the payment claims submitted by General Dental Services (GDS) dentists to the Dental Practice Board (DPB) in Eastbourne, Sussex, UK, and allowed the analysis of recorded intervals between the time an amalgam restoration was placed and any reintervention or extraction of the restored tooth was done. A total of 7,292,564 amalgam restorations were

placed. Of these, 2,532,836 required a reintervention and 578,928 required extraction.

RESULTS

The overall survival was 41% for restorations requiring no intervention within 15 years of placement. The percentage of survival until extraction at 15 years was 84%. Factors influencing survival were divided into tooth factors, patient factors, and dentist factors.

Tooth Factors

Larger restorations were less likely to survive to reintervention than smaller ones. Smaller restorations were also less likely to be extracted, with about 15% of teeth restored with an occlusal amalgam requiring extraction at 15 years, but 19% restored with a mesial-occlusal-distal (MOD) amalgam restoration requiring extraction at 15 years.

Restorations in the mandibular arch tended to perform less well than those in the maxillary arch with respect to survival and time until extraction. Third molar teeth had better survival than other teeth. In addition, anterior tooth restorations performed less well than posterior tooth restorations. When time to extraction was considered, anterior teeth performed dramatically less well than posterior teeth. The first molar had the best performance, with molars and premolars having similar times to extraction, but third molars had poorer performance than any of the others.

If a root canal filling is done in the same course of treatment as the amalgam restoration, the time to reintervention is reduced by about 15 percentage points and the time to extraction of the root-filled restored tooth is reduced again by about 15 percentage points. Placing a pin or screw is associated with reduced survival of about 10 percentage points and reduced survival of about 5 percentage points in the time to extraction of the restored tooth.

Dentist Factors

Restorations placed by male dentists had slightly worse survival than those placed by female dentists, with a difference of about 1 percentage point after 15 years for survival to reintervention and for survival to extraction. When the dentist's age was considered, a consistent but modest inverse correlation was seen between the age of the practitioner and the proportion of restorations that survived, regardless of whether it was to reintervention or to extraction.

Patient Factors

Over the first 8 years after a restoration was placed, gender of the patient did not affect survival. After that point, men had worse survival than women for both time to reintervention and time to extraction.

Restorations in younger patients performed more favorably than those of older patients (Table 11). Time to extraction data were more dramatically different than those for time to reintervention. Ten percent of the teeth restored with amalgam restorations in patients under age 20 years were lost by 15 years, but of those in patients over age 70 years, 30% were lost.

Table 11. Survival to Reintervention by Patient Age

	Survival (%) at				
Patient age	**1 year**	**5 years**	**10 years**	**15 years**	**n**
18 or 19	95	75	59	47	250,920
20 to 29	94	73	56	46	1,804,825
30 to 39	92	68	53	43	1,958,736
40 to 49	90	64	49	39	1,485,651
50 to 59	88	61	45	36	964,383
60 to 69	86	57	41	33	539,752
70 to 79	85	54	39	30	235,199
80 or over	85	54	38	–	53,098
All restorations	91	66	51	41	7,292,564

(Courtesy of Burke FJT, Lucarotti PSK: The ultimate guide to restoration longevity in England and Wales. Part 2: Amalgam restorations—time to next intervention and to extraction of the restored tooth. *Br Dent J* 224:789-800, 2018.)

When patients were exempt or remitted from payment, data on time to extraction indicate that the difference between them and patients who paid for their treatment was about 3 percentage points. Those who paid for their treatment had a longer time to extraction than those who did not. Little difference was noted between those who paid and those who did not with respect to time to reintervention.

History of dental treatment proved to be a major factor in the survival of amalgam restorations, whether for time to reintervention or time to extraction. For time to reintervention, the difference at 15 years was about 70% for those with a low annual expenditure for dental treatment and under 30% for those with high annual dental treatment expenditures. For time to extraction, those with low expenditures had a 93% survival and those with high fees had a 76% survival. High dental expenditure patients were found to lose 24% of their amalgam-restored teeth compared to 7% for patients with low annual dental expenditures.

Patients who came for treatment more frequently than once every 6 months had outcomes that were considerably worse than those who came for treatment at longer intervals. These

Clinical Significance

This large patient population yielded important information about the survival of teeth with amalgam restorations to either reintervention or extraction. Dentists should consider this information as useful when making decisions about what type of restoration the patient needs.

trends were the same for survival to reintervention and for survival to extraction.

DISCUSSION

Better survival was associated with smaller restorations and restorations located in posterior areas. In addition, younger patients had better amalgam restoration survival than those placed in older patients. Patient history of frequent visits to the dentist or higher annual treatment costs was also associated with a shorter time to reintervention or to extraction.

Burke FJT, Lucarotti PSK: The ultimate guide to restoration longevity in England and Wales. Part 2: Amalgam restorations—time to next intervention and to extraction of the restored tooth. *Br Dent J* 224:789-800, 2018

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SMOKELESS TOBACCO

Sports-related use of smokeless tobacco

BACKGROUND

Although smoking among youth has declined, the prevalence of youth using smokeless tobacco (ST) in 2015 rose to the same level as their use of cigarettes. Snuff and chewing tobacco products are linked to oral and pancreatic cancer as well as periodontal disease, dental caries, tooth loss, mucosal lesions, and other adverse oral conditions. The use of ST among major league baseball (MLB) players may be a factor in tempting youth to take up the habit. Dental professionals are likely to have youth among their patients who use or are tempted to use ST. This gives dentists the opportunity to counsel these patients regarding the dangers of using ST and hopefully will lead to them quitting or never beginning it.

METHODS

Tobacco behavior surveys were given to 360 male baseball players (mean age 15.8 years) at 25 rural California high schools. In addition, these players were asked how likely they thought it was that their favorite MLB player used ST. ST use was compared to their favorite player's use. Among ST never-users, the willingness and expectation they would use ST was judged in the context of their favorite player's use.

RESULTS

Demographically, the sample included 47% Hispanic/Latino and 41% non-Hispanic White individuals based on self-reports. Fifty-seven percent had at least 1 parent who had a college degree.

Thirty-one percent of the respondents had tried ST at least once, and 13% had used ST in the previous month. Both older age and identifying as non-Hispanic White showed a positive association with ST use.

When asked whether their favorite MLB player used ST, 8% said definitely yes, 36% said probably yes, 41% said probably not, and 15% said definitely not. The selection of MLB players included 82 players from 27 teams. The youth who believed their favorite MLB player definitely or probably used ST were significantly more likely than those who believed their favorite player did not or probably did not use ST to have tried ST themselves (38% versus 25%) and to have used ST in the previous month (18% versus 8%).

Statistical analysis showed a gradated, positive association between ST susceptibility and perceived ST use by a favorite MLB player. Those who never used ST but perceived their favorite player definitely did use ST were more likely to be willing to try ST, have positive expectations about their use of ST in the future, and to be susceptible to ST initiation compared to persons who believed their favorite player did not use ST. The relationship was robust even after adjusting for sociodemographic factors and persisted among never-users of any tobacco product.

Clinical Significance

MLB has prohibited players from carrying ST products on their uniforms but has not barred on-field use, which is often seen during telecasts. In addition, some cities have enacted ordinances to ban tobacco in MLB stadiums, although enforcement is challenging. It's unclear how influential these restrictions have been because of the wide perception that baseball and tobacco chewing are culturally intertwined. The dental team and public health professionals have the opportunity to step up and support consistent control measures aimed at tobacco use in sports and to prevent young fans from taking up the habit of using ST.