

# Behaviour of general dental practitioners in Germany regarding posterior restorations with flowable composites

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Because the recommendation to use flowables for posterior restorations is still a matter of debate, the objective of this study was to determine in a nationwide survey in Germany how frequently, for what indications, and for what reasons, German dentists use flowable composites in posterior teeth. In addition, the acceptance of a simplified filling technique for posterior restorations using a low stress flowable composite was evaluated. Completed questionnaires from all over Germany were returned by 1,449 dentists resulting in a response rate of 48.5%; 78.6% of whom regularly used flowable composites for posterior restorations. The most frequent indications were cavity lining (80.1%) and small Class I fillings (74.2%). Flowables were less frequently used for small Class II fillings (22.7%) or other indications (13.6%). Most frequent reasons given for the use of flowables in posterior teeth were the prevention of voids (71.7%) and superior adaptation to cavity walls (72.9%), whereas saving time was considered less important (13.8%). Based on the subjective opinion of the dentists the simplified filling technique seemed to deliver advantages compared to the methods used to date particularly with regard to good cavity adaptation and ease of use. In conclusion, resin composites are the standard material type used for posterior restorations by general dental practitioners in Germany and most dentists use flowable composites as liners.

**Key words:** Flowables, posterior restorations, user behaviour, Germany

Marginal defects of composite fillings are frequently regarded to be caused by an insufficient primary adaptation of the restorative material to the cavity walls<sup>1</sup>. To avoid these defects, particularly in posterior teeth, the use of flowable composites is often advised, because their superior flow behaviour increases both marginal and internal adaptation<sup>2,3</sup>. However, flowable composites have a lower filler load and usually poorer mechanical properties than sculptable composites. This is why a number of authors generally recommend using flowables only in minimally invasive Class I cavities<sup>4</sup>. Though flowables are often described as ‘stress breakers’, relatively thick layers will develop high polymerisation stress in the curing process; consequently, experts recommend applying flowables only in thin layers (as liners) in posterior restorations<sup>2</sup>.

Recently, a new type of flowable composite has been launched in Europe (SDR<sup>TM</sup> Smart Dentin Replacement; DENTSPLY DeTrey, Konstanz, Germany); unlike conventional flowable materials, it is characterised by low polymerisation stress development<sup>5,6</sup> and therefore during the time of the study represented the only flowable composite material in Germany indicated

to be applied in layers up to 4 mm in thickness (bulk placement). The occlusal part of the restoration has to be capped with a regular posterior composite<sup>3</sup>.


Because the recommendation to use flowables for posterior restorations is under debate, the objective of this study was to determine in a nationwide survey how frequently, for what indications, and for what reasons, German dentists use flowable composites in posterior teeth. In addition, the experience and acceptance of a simplified filling technique using a low stress flowable composite was evaluated.

## MATERIAL AND METHOD

### Recruitment of the participants and conduct of the survey

The participating dentists were selected at random within four major regions determined on the basis of (2-digit) postcode areas (*Table 1*). The database used to contact these dentists was a commercially available file containing the addresses of German dental practitioners.

**Table 1** Regions from which dentists were selected at random, two-digit postcode areas, and numbers of dentists visited

Region	Number of dentists in the region	Number of collaborators	Dentists from the following postcode areas	Number of dentists visited	Percentage of dentists visited	Map of Germany
North	8,064	4	19, 20, 21, 22, 29, 30, 31, 37, 38, 48, 49	411	5.1	
West	14,799	8	34, 35, 41, 40, 42, 44, 45, 47, 50, 51, 52, 53, 56, 57, 58, 61	1,093	7.4	
East	14,505	6	01, 02, 03, 04, 06, 07, 08, 09, 10, 12, 13, 15, 16, 17, 18, 23, 39, 95, 96, 98, 99	1,073	7.4	
South	12,842	7	70, 71, 72, 74, 79, 80, 81, 82, 83, 84, 85, 86, 90, 91, 93, 94	641	5.0	
Germany	50,210			3,218	6.4	

The dentists were visited (*Table 1*) within a period of 2 months (February–April 2010) by dental students exclusively hired and trained (briefed) to conduct this survey. After an oral description of the objective of the survey, each participant was given a questionnaire and an information leaflet on the study procedures. Additionally the dentists received a product sample of SDR™ (SDR™ Smart Dentin Replacement, DENTSPLY DeTrey) for a trial of a simplified posterior filling technique in which the first layer of flowable composite (SDR™) is placed in bulk for up to 4 mm and afterwards covered with any other composite suitable for posterior restorations<sup>3</sup>.

The participants were asked to send the completed questionnaires to a central fax number and of 3,218 dentists visited, 2,985 initially agreed to participate. Completed questionnaires were returned by 1,449 dentists, so the response rate was 48.5% and 1,319 questionnaires which had been correctly completed were evaluated.

### Questionnaire

The questionnaire explored the frequency of use of filling materials in general and flowable composites in particular for posterior restorations. Besides, the dentists were asked for what indications and for what reasons they used flowables. Dentists who did not use flowables for posterior restorations were asked why they did not.

The following six questions were addressed:

- What type of filling material do you use for posterior restorations?

The participants were asked to choose between ‘composite’, ‘amalgam’, ‘compomer’, ‘glass-ionomer’, ‘others’ and had to estimate the frequency of use for each category in ‘percent of restorations’.

- Do you preferably use a flowable composite for posterior restorations?

The participants could choose between ‘yes’ or ‘no’.

- For what indications do you use your flowable composite?

This question was only asked of participants who stated they used flowables.

They could choose between ‘as liner’, ‘for small class I restorations’, ‘for small class II restorations’ and ‘others’, which had to be named. Multiple answers were possible.

- Why do you use a flowable composite for posterior restorations?

This question was only asked of participants who stated they used flowables.

They could choose from the following answers, multiple answers were possible: ‘to avoid voids’, ‘because minimal invasive cavities require a flowable material’, ‘for better adaptation to the cavity wall’, ‘as stress breaker’, ‘to save time’ and ‘other reasons’, which had to be named.

- Why do you not use a flowable composite for posterior restorations?

This question was only asked of participants who stated they did not use flowables.

They could choose from the following answers, multiple answers were possible: ‘because flowables have to be applied in small increments to compensate higher shrinkage stress’, ‘because of their lower mechanical strength’, ‘because of their higher occlusal wear’, ‘because they are not sculptable’, ‘because it doesn’t give me a clinical advantage’ and ‘other reasons’, which had to be named.

- Please rate the test material in comparison with your current filling material for Class I and II cavities with regard to the following properties: time saving, simplicity of procedure, overall handling, creation of good proximal contacts and internal adaptation. Each aspect had to be rated in comparison to the technique currently used by the dentist. The participant could choose between ‘better’, ‘slightly better’, ‘slightly worse’ and ‘worse’.

**Statistics**

The returned questionnaires were anonymised, and the data were processed using the statistics program PASW 17.0 (IBM, Ehningen, Germany). Frequency distributions and arithmetic means with standard deviations were used for descriptive statistical representation of the results.

**RESULTS**

**Frequency of use of various filling materials**

The dentists answered the question as to what types of filling materials they used for posterior restorations as follows:

- Universal composite – 84.7%
- Posterior composite – 29.8%
- Amalgam – 49.8%
- Compomer – 26.8%
- Glass ionomer – 49.2%.

Table 2 additionally displays how frequently each type of material is used when present in a dental practice. A total of 84.7% of all dentists use universal composites for 59.2% of their cases, thus making this type of material the predominant one for posterior restorations in Germany (Table 2).

**Use of flowable composites for posterior restorations**

A total of 78.6% of the dentists preferably used flowable composites for posterior restorations. The most frequent indications were cavity lining (80.1%) and small Class I fillings (74.2%). Flowables were less frequently used for small Class II fillings (22.7%) or other indications (13.6%), such as fissure sealing, Class V fillings or filling repair.

The distribution of answers to the question as to why flowable composites were used is shown in Figure 1. Prevention of voids (71.7%) and superior adaptation to cavity walls (72.9%) seemed to matter most, whereas saving time was considered less important (13.8%) (Figure 1).

The dentists who did not use flowables most frequently gave the following main reasons for their

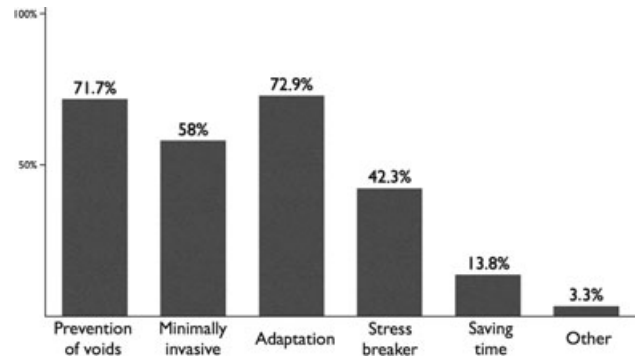


Figure 1. Distribution of answers (in %) to the question ‘Why do you use a flowable composite for posterior restorations?’ (n = 1,033, multiple answers possible).

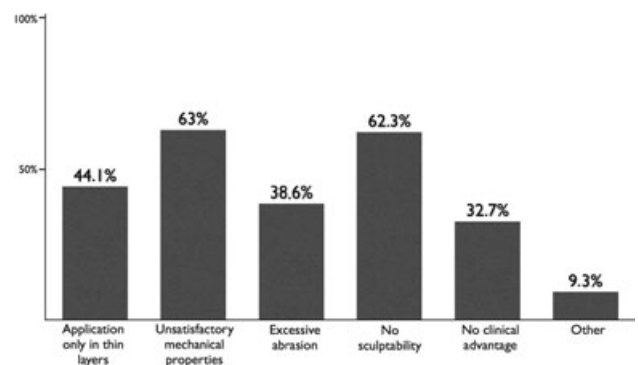


Figure 2. Distribution of answers (in %) to the question ‘Why do you not use a flowable composite for posterior restorations?’ (n = 281, multiple answers possible).

decision: unsatisfactory mechanical properties (63.0%) and no sculptability (62.3%) (Figure 2). The ratings of the simplified posterior filling technique with regard to handling in general, ease of use, adaptation to cavity walls, proximal contact and time needed to place a restoration are shown in Table 3. There were no significant differences between flowable and non-flowable users (data not shown).

**DISCUSSION**

The survey visited 6.4% of all dentists in Germany, the participants having been randomly selected and hailed

**Table 2** Frequency of use of various types of filling materials for posterior restorations (question 1)

Type of filling material	Relative number of practices using the respective material type for posterior restorations [%]	Mean relative number of posterior restorations for which the respective material type is used if present in the practice [%] arithmetic mean (SD)
Universal composite	84.7	59.2 (29.2)
Posterior composite	29.8	42.9 (28.5)
Amalgam	49.8	34.0 (26.0)
Compomer	26.8	22.2 (22.0)
Glass ionomer	49.2	16.8 (16.9)
Other	15.4	22.9 (24.8)

**Table 3** Rating of the SDR Filling Technique with regard to various parameters in comparison with the technique used to date by the dentist for posterior fillings ( $n = 1,319$ )

	Better, %	Slightly better, %	Slightly worse, %	Worse, %	n/a, %
Timesaving	34.5	47.9	10.3	1.1	6.2
Simplicity of procedure	37.9	48.2	7.8	0.8	5.3
Overall handling	30.1	53.0	10.1	1.6	5.1
Approximal contact	11.9	39.5	34.3	6.7	7.7
Adaptation	30.3	54.4	8.2	1.0	6.0

from different regions all over the country. Therefore, we assume that the present results provide a representative picture of the current situation in Germany. However, comparable data are currently not available in the literature. The response rate of almost 50% in this questionnaire based survey can be considered as reasonable compared to other recently published studies: 70%<sup>7</sup>, 60%<sup>8</sup>, 51%<sup>9</sup> and 16.5%<sup>10</sup>.

In this survey, universal resin composites represent the predominant material class for the restoration of cavities in posterior teeth. Our data reveal that approximately 85% of the dentists in Germany use them for 60% of the restorations placed in their practices (Table 2). More than 50% of the dental offices are 'amalgam-free', which is an interesting observation, based on the fact that the governmental insurance system in Germany still defines amalgam as the standard material for posterior restorations. If a patient wishes to receive a composite restoration for posterior teeth usually additional payments are necessary. The frequency of use for each material class shows a high degree of variance among offices as the high standard deviations reflect in Table 2. Even glass ionomer restoratives are used by 1.9% of the dentists for more than 80% of their posterior restorations. However, most dentists (83.4%) use glass ionomers for less than 30% of their cases (data not shown). Glass ionomer materials were found in almost 50% of all practices (Table 2). There was no single dental practice, which was not using composites for posterior restorations.

Most of the dentists (78.6%) use flowable composites mainly as a liner (first thin increment) in order to obtain a better adaptation to the cavity wall (72.9%) and to limit the incorporation of voids (71.7%). Based on these data it might be concluded that besides the different handling the main motivation for dentists to use flowables is the increase in the quality of their restorations rather than expected time savings (13.8%). This is in accordance with recommendations from the scientific literature<sup>2</sup>. Also the recommendation to use flowables as sole restorative material only for small class I cavities<sup>4</sup> is reflected by the answers in this survey; 74.2% of the participants use flowables for the indication of class I and less frequently for small class II restorations.

Recently a new posterior restorative material has been introduced to the European and North American market under the two brand names SDR<sup>TM</sup> Smart Dentin Replacement (DENTSPLY DeTrey) and SureFill SDR<sup>TM</sup> flow (DENTSPLY Caulk, Milford, DE, USA) respectively. In contrast to conventional flowable resin composites SDR<sup>TM</sup> creates a very low shrinkage stress during and after polymerisation<sup>5,6</sup>, which is why it is indicated for use to be placed in layers up to 4 mm (bulk-fill) and then to be capped with a regular composite. Because during the time of study in Germany just SDR<sup>TM</sup> was indicated to allow this simplified filling technique, it seemed to be justifiable to include an acceptance-evaluation by general dental practitioners in this survey. Within the limitations of this study, the data reveal that dentists see some advantage in this extended use of a flowable material in terms of handling in general, ease of use, adaptation to cavity walls and time needed to place a restoration but not in terms of the creation of good proximal contacts (Table 3). Interestingly, no relevant difference could be found between flowable and non-flowable users (data not shown).

The widespread use of flowables and the positive subjective evaluation of the provided test material make it likely to estimate that the use of flowable composites will further increase. However, the long term success of extended flowable use has to be proven by clinical data.

## CONCLUSIONS

More than half of the practitioners in this survey no longer use amalgam. Resin composites are the standard material type used for posterior restorations by general dental practitioners in Germany and most dentists use flowable composites as liners.

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## REFERENCES

1. Frankenberger R, Krämer N, Pelka M *et al.* Internal adaptation and overhang formation of direct class II resin composite restorations. *Clin Oral Invest* 1999 3: 208–215.

2. Frankenberger R, Lopes M, Perdigao J *et al.* The use of flowable composites as filled adhesives. *Dent Mater* 2002 18: 227–238.
3. Hofmann N. Zeitgemäße Schichttechnik für Komposit im Seitenzahngelände. *Quintessenz* 2010 6: 567–572.
4. Stavridakis MM, Dietschi D, Krejci I. Polymerization shrinkage of flowable resin-based restorative materials. *Oper Dent* 2005 30: 118–128.
5. Ilie N, Hickel R. Shrinkage behaviour of novel flowable composites based on the SDR<sup>TM</sup>-technology. *Dent Mater* 2010 26: e130.
6. Ilie N, Hickel R. Investigations on a methacrylate-based flowable composite based on the SDR<sup>TM</sup> technology. *Dent Mater* 2011 27: 348–355.
7. Seow LL, Toh CG, Wilson NH. A survey of current practices among general dental practitioners in Manchester in 2002. *Prim Dent Care* 2003 10: 87–92.
8. Eckerbom M, Magnusson T. Restoring endodontically treated teeth: a survey of current opinions among board-certified prosthodontists and general dental practitioners in Sweden. *Int J Prosthodont* 2001 14: 245–249.
9. Gilmour AS, Latif M, Addy LD *et al.* Placement of posterior composite restorations in United Kingdom dental practices: techniques, problems, and attitudes. *Int Dent J* 2009 59: 148–154.
10. Naumann M, Kiessling S, Seemann R. Treatment concepts for restoration of endodontically treated teeth: a nationwide survey of dentists in Germany. *J Prosthet Dent* 2006 96: 332–338.

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