Retrospective clinical study of minimally invasive full-mouth rehabilitations of patients with erosions and/or abrasions following the “3-step technique”. Part 1: 6-year survival rates and technical outcomes of the restorations

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Abstract

Purpose: To evaluate the survival rates and technical outcomes of minimally invasive full-mouth rehabilitations in patients affected by dental erosion and attrition. Materials and Methods: For this retrospective study, 28 subjects (8 women, 20 men; mean age: 45.6 years) who suffered from generalized erosions and attrition and who were treated according to the 3-step technique were invited to participate. The patient records were reviewed, and the restorations were clinically and radiographically examined. This part of the study (part 1) evaluated restoration survival and technical outcomes using the modified United States Public Health Service criteria (mUSPHS). Survival analysis was performed using Kaplan-Meier survival statistics, and comparison between subgroups was made using log-rank test. For all other comparisons, cross-tabulations of occurrence were performed, and significance was tested using Pearson chi-square test. The level of statistical significance was set at P < .05. Results: A total of 19 patients (3 women, 16 men; mean age: 45.6 years) agreed to participate. In these patients, 406 restorations (149 direct composites, 110 onlays, 147 veneers) supported by 365 teeth were examined. The mean time in service was 71.8 ± 28.6 months. Six failed restorations were identified; all were direct composites. The 6-year survival rates were 97.3% for direct composites, 98.2% for onlays, and 100% for veneers (P > .05). No differences were found among materials and locations of the restorations. Nineteen technical complications included 14 partial fractures, 3 fissures, 1 wear, and 1 decementation. The mUSPHS evaluation showed good technical outcomes. Presence or absence of a nightguard influenced restoration survival (P = .003). Conclusion: Minimally invasive rehabilitations of patients with erosions/attrition with the 3-step technique are a reliable treatment option in the medium term. Protective nightguards are recommended. Int J Prosthodont 2021. doi: 10.11607/ijp.7294

Introduction

Dental erosion is defined as a process of gradual destruction of the tooth substance by a chemical attack with acid (1). The acids responsible for erosion are usually not products of the intraoral flora, but are from extrinsic or intrinsic sources (1). The origin of the latter is the gastric acid which appears during gastrointestinal diseases
(e.g. gastroesophageal reflux disease) or eating disorders. Extrinsic acid attacks origin from the repeated consumption of acidic beverages and/or general acidic dietary habits. Excessive consumption of acidic drinks and food were shown to lead to the rise of erosive tooth wear (2). Depending on the source of the acid attack the locations of the lesions can differ (3).

At the early stage, in the posterior region, the erosive occlusal lesions lead to rounded cusps and edges of restorations above the level of adjacent tooth surfaces can be noticed (4). In the anterior region, the first grade of vestibular lesions appears as a concavity in the enamel with a thin intact layer at the cervical margin and at the level of contact point. Later, the involvement of dentin is a sign for more severe situation (5).

As the progression of this disease is slow, the patient is generally long unaware of the problem. The first noticeable aspect, after repeated exposure of the teeth to acid, is impaired smile esthetics and hypersensitivity. Loss of dental shape and chipping of the incisal edges are generally the main reason for the patients to consult a dentist (6). A combination of erosion with occlusal attrition can accelerate the wear process (7). At later stages, after severe tooth destruction, pulpitis, pulp necrosis or periapical infection induce the need for a treatment (8).

Before the era of adhesion, the patients suffering from dental erosions and/or attrition were rehabilitated by means of conventionally cemented fixed dental prostheses (FDPs) such as crowns and bridges to restore their function and esthetics (9-13). For good long-term outcomes of these conventional restorations, geometrically retentive principles like the resistance and retention of the tooth preparation were crucial (14). The retentive tooth preparations were, however, invasive and significant amounts of additional loss of tooth substance were reported (15, 16). Furthermore, 10% of the previously vital abutment teeth were reported to loose their vitality during the first 10 years of follow-up (17-19).

With the development of the adhesive techniques, alternatives like e.g. direct composite restorations, were available to restore even large defects (20). Studies have shown a promising survival rate of composite restorations (inlays, onlays, etc) with the improvements in bonding technique, bonding materials and restoration materials (21-25).

Nowadays, thanks to the well developed adhesives, indirect, minimally-invasive restorations such as veneers or overlays, made out of dental ceramics or resins can be bonded to the tooth substance with resin cements (26).
Ceramic materials exhibit similar physical and mechanical properties as enamel (27, 28). Thanks to the etching and bonding technique and the improvement of the material properties, dental ceramics can predictably be used for restorations both in anterior and posterior regions (29). The minimally-invasive types or restorations like inlays, onlays/ overlays and veneers are widely used for the re-establishment of the esthetics and the function, as well as for the augmentation of the vertical dimension of occlusion (VDO) today (29-32). The main advantage of these types of restorations is, that significantly less tooth preparation is needed as compared to the conventional FDPs (15, 16). They can, hence, be very promising for the minimally-invasive rehabilitation of patients with erosive/ abrasive loss of tooth substance.

In 2005, a new minimally-invasive treatment concept has been developed at the University of Geneva for the rehabilitation of patients with erosive and/or abrasive tooth wear, the “3-step technique” (33-35). The “3-step technique” is a protocol to stabilise patients affected by generalised loss of tooth structure, where 3 laboratory steps are alternated to 3 clinical procedures to validate clinically the full-mouth reconstruction (progressive waxup) (33-35). Thank to an increase of vertical dimension of the occlusion (VDO), additive, not invasive, or minimally invasive adhesive restorations, such as onlays and veneers, are delivered. This very low invasive approach is promising, yet, scientific literature evaluating the concept is scarce. Only one clinical case series is available up to date, demonstrating good preliminary outcomes of the rehabilitations (36). In order to be accepted as a concept and implemented in daily clinical practice, randomized controlled clinical trials (RCT), and more prospective and retrospective studies with longer follow-up periods are needed.

The aim of the first part of this retrospective study, hence, was to evaluate the medium to long-term clinical survival rates and technical outcomes of the “3-step technique” at full-mouth rehabilitations of patients suffering from erosions/attrition (33-35). Part 2 of the study focussed on the biologic and the esthetic results, and the patient reported treatment outcomes, reported in a second manuscript (Sierra D et al., accepted with revisions IJP, currently under second review).
Materials and methods

Study design

This retrospective non-interventional study was based on the evaluation of patient records and on the clinical follow-up examination of subjects affected by generalized erosive and/or attrition tooth wear, having received a full-mouth rehabilitation following the previously mentioned “3-step technique” (33-35). The subjects were treated at the University of Geneva and in one associated private practice.

The study protocol was developed at the Division of Fixed Prosthodontics and Biomaterials of the University Clinics of Dental Medicine, University of Geneva. This study protocol and the associated patient documentation was reviewed and approved by the local ethical committee (CCER, N° of project: 2016-01716).

Subject recruitment

For this study, the patient databases at the University and the private practice were screened for eligible subjects. Subjects fulfilling the following criteria were envisaged for the present investigation:

Inclusion criteria:
- Subjects who received a full-mouth rehabilitation at the University and/or the private practice according to the process of the 3-step technique
- Male and female patients from 18-80 years of age
- Subjects who had suffered from different kinds of lesions due to erosion (bulimia, gastroesophageal reflux disease (GERD), diet) and/or bruxism (clenching, grinding, behavior disorders)
- Minimum service time of the restorations of 12 months

Exclusion criteria:
- “Modified 3-step technique”, i.e. partial rehabilitation of the tooth wear
- Less than 12 months of service time of the restorations

Out of a total of 45 potential subjects, who had received a treatment according to the “3-step technique” (33-35), 28 fulfilled the above inclusion criteria.

The eligible 28 subjects (8 females, 20 males; mean age 45.6 years) were contacted by telephone and informed about the study purpose and procedures. Thereafter, the subjects received the detailed patient information
documents via mail and potential questions were clarified via telephone or e-mail. Finally, the subjects willing to participate gave written consent, and received an appointment for the clinical examination.

For the rehabilitation of the posterior areas of these subjects, direct occlusal composite restorations, or indirect composite or ceramic onlays/occlusal veneers had been made. In the anterior areas, palatal veneers and in some cases additional facial veneers, made out of direct composite, indirect composite or ceramic were used.

In general, three groups of materials were used for the treatments, resin composites, feldspathic ceramic and lithium disilicate ceramic (details on brands and manufacturers are given in Table 1). The resin composites were used for the direct restorations, and for the adhesive cementation of the indirect restorations (details on brands and manufacturers are given in Table 1).

Information retrieved from the patient records

Age and gender of patients, details on the etiology of the tooth wear, date of first appointment with dentist, date/s of restoration insertion, details on prosthetic procedures and materials, details on presence or absence of nightguards, timing of the delivery of the nightguard, details on radiologic examinations before the present follow-up, complications before the present follow-up examination and, finally, repairs or replacements of the restorations over time.

Clinical Follow-up examinations

All clinical and radiologic examinations were performed by two calibrated examiners. The calibration was performed by one senior researcher experienced with clinical follow-up examinations.

Firstly, the general information extracted from the patient record, was reviewed with the subject (e.g. etiology of the wear, delivery and use of nightguard after treatment completion). Thereafter, a full mouth clinical examination was made.

For the evaluation of the survival of the restorations (anterior and posterior), the restored teeth were clinically examined and the details were compared to the information in the patient record.
Restoration *failure* was classified into the following 4 categories according to the main reason for the failure:

- fracture of restoration, almost complete or complete wear of restorative material (loss of function), non-reparable secondary caries at restoration margin, or “other”.

If the restoration was damaged or repaired, the type of *complication* was classified according to the following 5 categories: partial fracture of the restoration, fracture line/ fissure within the reconstructive material, pronounced superficial wear of restoration (still functional), de-cementation or “other”.

The detailed technical evaluation of the restorations was performed using the modified United States Public Health Service (mUSPHS) criteria (37, 38). The following technical parameters were evaluated: Color Match, Marginal Adaptation, Marginal Staining, Anatomic Form, Surface Roughness, Occlusal Contacts, Interproximal Contacts. Occlusal contacts were assessed with 12 μm occlusion foil (Hanel, Coltène/Whaledent Inc, Langenau, Germany) and interproximal contacts with dental floss (Reach Dental Floss, waxed, Johnson & Johnson, New Brunswick, NJ, USA). All findings were rated with either Alpha, Bravo, Charlie ratings (Table 2).

If any repairs had been made before the follow-up examination, the type of complication that had occurred was classified according to the above classification, and the time point was included in the data analysis. If the time point of complication was unknown, the date of the follow-up visit was considered.

Replaced restorations before the present follow-up were considered as failures taking into consideration the time point of replacement. If the time point of restoration replacement was unknown, the date of the follow-up visit was considered.

For further documentation, standardized clinical extra-oral and intra-oral photographs were taken, as well as intraoral optical impressions (Trios 3, 3Shape, Copenhagen, Denmark). These impressions were considered as baseline impressions for future retrospective examinations of the same subjects and were not evaluated in the present study.

Finally, in case the existing radiographs were older than 2 years, standardized radiographs (bite wing, peri-apical) were taken to assess the presence or absence of interproximal secondary caries or of endodontic problems.
Statistical analysis

Database:

All information concerning the subjects were entered in a spreadsheet using an identification number (ID) for
each subject.

Another spreadsheet was completed to enter all the information concerning each restoration. The restoration
identification number combined the ID of the subject, the tooth, and the surface restored.

The spreadsheets were imported in a statistical package (IBM® SPSS Statistics version 25 (IBM corp.) and
merged to create a database containing all the information collected.

Descriptive analysis of the subject was performed using the patient as the statistical unit.

The small group of patients was very homogenous, as the subjects had all suffered from the same clinical
problem, severe erosion, they were all clinically managed following strictly the same protocol, and they had
been entered in a regular follow-up program following the rehabilitation. Hence the patient was not
considered as a potential confounder in the analysis, and therefore, the restoration was chosen as the
statistical unit for survival analysis.

Distribution of the data:

Except for a few variables, all the continuous variables were not distributed according to a Gaussian curve.
Kruskall-Wallis and Mann-Whitney tests were therefore used to compare groups.

Statistical test:

Kaplan-Meier procedure was used to estimate survival and comparison between subgroups were made using
the log-rank test.

For all other comparisons, cross tabulations of occurrence were performed significance was tested using
Pearson Chi-square test.

Results

Of the 28 subjects that were contacted, 19 agreed to participate in the present retrospective evaluation (16
males, 3 females, mean age of 45.6 years (range 30 to 73y)). Seven of the subjects were treated at the
University of Geneva and 12 subjects in the associated private practice. Nine subjects (6 females, 3 males) did not participate in the study for different reasons. One had passed away, one other had medical issues, two had emigrated, and two did not wish to participate for undisclosed reasons. Three subjects did not respond to the invitation.

In total, 406 posterior and anterior restorations, supported by 365 abutment teeth were examined. The reason for the higher number of restorations than abutment teeth was, that in the anterior segments separate palatal and facial veneers had been made in some cases, and those restorations were separately considered.

Of these, 149 restorations were made out of direct composite, 147 were indirect veneers and 110 were indirect onlays, both made either out of composite or ceramic (for details see Table 3). Data concerning adhesive cementation involved only various composite resin (for details see Annex 1).

Out of the 19 patients, eleven patients reported to regularly wear a nightguard for the protection of the rehabilitation.

The mean follow-up time of the restorations was 71.8+/−28.6 months, representing a mean time-in-funtion of 6 (+/− 2.4) years. A representative clinical case example with a 6y follow-up is given in Figures 1 to 5.

Overall survival rates of the restorations:

The review of the patient records and the clinical examination revealed that 6 restorations were lost prior to this follow-up visit (Table 4). The overall 6-year survival rate of all restorations was 99% (Figure 6).

In more detail, the survival rate of the direct posterior/ anterior composites was 97.3%; of the indirect ceramic/composite posterior onlays the survival rate was 98.2%, and of the indirect ceramic/composite anterior veneers the survival rate was 100% (p>0.05).

When focusing on the applied materials (composite, feldspatic ceramic and lithium disilicate ceramic) survival rates were 97.8% for the composite restorations and 100% for the ceramic restorations. The difference was not significant (p= 0.096).

Comparing the outcomes with respect to the cementation resin material (Miris, Tetric, Filtek), the survival rates were similar with, respectively, 100% vs 98.7% and 97.7% (p>0.05).
Wearing a nightguard had a positive effect on the survival of the restorations. Lower restoration failure rates were found for subjects regularly wearing a nightguard (0.4%), while subjects not wearing a nightguard had a significantly higher rate of failure of restoration (4.6%) (p=0.003). (Annex 4)

When comparing anterior and posterior regions, the overall 6y-survival rates of the restorations were similar with 99.1% vs. 97.7% (p>0.05), respectively. Yet, when comparing maxillary and mandibular restorations, better 6-year survival rates were found for the maxillary restorations (99.6% vs 97.2%, p=0.038).

Details about failures:

Of the 6 failures, one was associated with the fracture and subsequent extraction of the abutment tooth as recorded in the patient documentation. The 5 others failed restorations were missing at the time of the present follow-up visit. Detailed reasons for the failures are displayed in Annex 2.

Figures 7a and b show representative examples of restorations judged as failing in this follow-up examination.

Overall technical complication rates:

The overall technical complication rates were 6.0% for the direct composites, 1.8% for the onlays and 5.4% for the veneers. For details see Table 5.

There were no significant differences of the technical complication rates neither between the restorations types, nor the locations of the restorations (anterior vs. posterior regions, maxillary vs. mandibular restorations (p>0.05).

When focusing on the material types, the total complications rate was 8.7% for the composite restorations, 10.7% for the feldspathic ceramic and 0% for the lithium disilicate ceramic restorations. No significant differences of the technical complication rates were found between materials and cementation materials.

The use of a nightguard had no significant impact on the complication rate, and on the kind of complication that occurred.

Detailed technical outcomes:

In total, 14 restorations with partial fractures, 3 restorations with cracks/ fissures within the restorative material, one restoration with pronounced wear and one de- and re-cemented restoration were found. Figure
8 displays a case with complications, i.e. fissures/cracks in facial veneers extending to the palatal direct composites.

Partial fractures occurred at direct composite restorations (n=8), (indirect) onlays (n=2) and veneers (n=4). Cracks or fissures (n=3), and decementation (n=1) were found at veneers. The case of wear (n=1) was noticed on a posterior composite restoration.

As for the material involved, composite was implicated in 78.5% (n=11) of the partial fractures, in the unique cases of decementation (n=1) and wear (n=1). Feldspathic ceramic was the material affected by 21.5% (n=3) of the partial fractures and 100% (n=3) of the fissures. Lithium disilicate was not affected by any of the complications.

The localization of the partial fractures was similar in the anterior and posterior regions of the jaws. All three fissures and the restoration exhibiting decementation were located in the anterior regions, while the case of wear was located in the posterior region. 57.1% of the partial fractures (n=8) and 66.6% of the fissures (n=2) occurred in the maxilla. The restorations exhibiting decementation and wear were also located at the maxilla. Details can be seen in Annex 3.

The evaluation of the technical outcomes by means of mUSPHS criteria showed generally good outcomes of the rehabilitations with respect to color match, marginal adaptation, marginal staining, anatomic form, surface roughness and interproximal contacts. Clinically unacceptable loss of occlusal contacts rated Charlie was observed in 19.2% of the restorations, however. (For details see Table 6)

When the impact of the restoration type and the surface roughness was correlated, veneers had a significantly better outcome compared to onlays and direct composites (p=0.004). The part of the restorations on the occlusal and facial sides were more rough than other parts (p<0.001). Interestingly, type of material (composite vs ceramic) had no influence on the surface roughness (p=0.097).

Marginal adaptation was also significantly better at veneers than at onlays and direct composites (p<0.001). Marginal adaptation of occlusal restorations was significantly worse than restorations on other surfaces of the teeth (p<0.001).

Less marginal staining was observed at the composite restorations than at ceramic restorations (p=0.036). The restorations treating the occlusal and facial surfaces of the teeth had significantly more marginal staining than
other parts of the teeth (p=0.032). The type of the restoration and the cementation material had no impact on the marginal staining (p=0.878 and p=0.934, respectively).

Anatomic form was better achieved with ceramic materials than with composite materials (p=0.001), and with indirect restorations than with direct restorations (p<0.001).

The regular use of a nightguard was generally correlated to less problems (failures and complications) with the restorations (p=0.013). The wear of a nightguard had a protective effect against the failure (5 failures with “non-nightguard wearer” against one with a “nightguard wearer”) (p=0.003). At the opposite, the use of a nightguard was not protective against technical complications (p=0.957) (Annex 4).

**Discussion**

The present study showed very good overall 6-year survival rates (OSR) of the restorations inserted according to the “3-step concept” for the minimally invasive full mouth rehabilitations of patients affected by erosions and/or attrition. No differences of the survival rates were found, neither between types of restorations (direct composites, indirect overlays, anterior veneers), nor between the materials used (resins, ceramics). A trend to better outcomes of the indirect ceramic restorations, however, was observed. The overall technical complication rate (TCR) was low, furthermore, the modified US Public Health Service (mUSPHS) ratings displayed very good 6-year technical outcomes of the restorations. The regular application of a nightguard positively influenced the outcomes of the restorations.

The present high survival rates are similar to or even exceeding the outcomes reported in other studies on minimally invasive restorations. In comparison, a study reporting on direct composites showed a survival rate of 99.3% after 3,5 years (39). Another systematic review on composites restorations showed a annual failure rate varying from 1% to 3% in posterior teeth while it was between 1% to 5% in anterior teeth (40). Concerning ceramic inlays, onlays and overlays, one meta-analysis on 5- and 10-year outcomes reported, respectively, a 92-95% and 91% estimated survival rate. Unfortunately, insufficient data was available to conduct the same analysis on composite material (41). One study on indirect composite restoration with small sample size reported, at 5-years, a survival rate of 91.2% for onlays and 90.9% for overlays (42). Another meta-analysis study about the veneers (porcelain and glass-ceramic) found an estimated overall cumulative survival rate of 89% while the median of the maximum follow-up times was 9 years (43).
The survival rates in the present study were similar for all tested types of restorations and were not influenced by the type of material. Concerning this latter point, existing literature is incomplete and further studies are needed to further elucidate these findings. The type of cement used for fixation did not have a significant influence on the outcome, also shown in another study (44).

Furthermore, the outcomes were similarly high in anterior and posterior regions in the present as in a previous study (41). The maxillary restorations exhibited higher survival rates than the mandibular ones, though. This observation is contradistinctive in the literature, as the present results are in accordance with one published research (45), but not with several others (46-48).

Interestingly, the use of a nightguard was associated with better survival rates of the restorations. Patients not willing to wear a nightguard after the rehabilitations experienced more loss of restorations. This finding was assumed before (49-51), but only one study, besides the present one, addressed the correlation of the presence or absence of a nightguard and the outcomes of the restorations (52). The authors reported similarly better outcomes of the restorations in the presence of a nightguard.

In general, the technical outcomes of the present restorations were very good. Low complications rates were found. Yet, partial fractures were found, predominantly occurring at composite restorations (40, 53). Indirect restorations such as overlays or overlay/veneers exhibited better outcomes after 6-years than direct restorations. The same was observed as a trend also in other study comparing the outcomes of direct and indirect posterior restorations (53). These observations may indicate, that for better longevity of the minimally-invasive rehabilitations, indirect restorations are preferable. More clinical studies such as randomized clinical trials, however, are needed to evaluate this assumption (54).

Including more patients, thus evaluating more restorations for this study would have permitted us to achieve sound statistical analysis. Nevertheless and although some differences did not reach statistical significance, trends could be seen.

The technical evaluation by means of mUSPHS criteria displayed very good technical 6-year performance of all types of restorations. Occlusal wear of the restorations due to abrasion (poor surface roughness and anatomic form) leading to weak occlusal contacts was found over time. This can be related to the better outcomes with respect to the anatomic form with ceramic material than composite material and the wear of a nightguard. Those parameters may also explained why the marginal staining was more pronounced on those surfaces.
Veneers had a very good outcome in terms of surface roughness and marginal staining. This may be associated to an easier access to the concerned areas that permits the operator to better polish those areas.

In any case, the regular use of a nightguard should become integral part of any minimally-invasive rehabilitation. This has also been recommended in another study reporting the outcomes of minimally-invasive restorations (50).

The present study indicates that minimally-invasive rehabilitations according to the previously published “3step concept” can be recommended as a treatment option for patients with erosive and/or abrasive tooth wear. Due to its retrospective nature, the lack of standardization of the types of restorations, the materials used and the adhesive cementation means are limitations of this study. Randomised controlled clinical trials, in the best case with a split mouth design, are needed to define the ideal types of restorations and the materials for these types of rehabilitations in the future. Furthermore, the cost benefit ratio and the patient reported outcomes should be considered in future prospective research on the minimally invasive full mouth rehabilitations like the one developed as “3step technique”.

Conclusions

- Minimally invasive full-mouth rehabilitations of patients with pronounces tooth wear due to erosions/attrition by means of the “3-step technique” exhibit good clinical medium-term outcomes with respect to survival of the restorations, and the general technical outcomes.

- Based on this evaluation, all types of direct and indirect composite or ceramic restorations exhibited good medium-term outcomes. In posterior sectors, a trend to better outcomes was observed with indirect ceramic restorations. More studies, however, are needed in the future to further evaluate and compare the restorative options.

- Patients who have been treated with the present concept and other minimally-invasive treatment approaches should receive a nightguard for the protection of the restorations.
Acknowledgements

The authors have no conflict of interest with respect to this manuscript. In order to avoid bias, the co-author involved in the development of the tested “3-step technique” (FV) was not involved in the clinical examinations and the evaluation of the data.

References
Figures, Tables and Legends

**Figures 1 a-d**
Clinical case example: Male patient, 34 years old. Restorations after delivery. Upper anterior teeth were restored with palatal indirect composite veneers.

**Figures 2 a-d**
Same patient from Figures 1a-d: Posterior eroded teeth were restored with direct composite for the upper jaw and composite onlays for the lower jaw.
Figures 3 a-d:
Patient of Figures 1 a-d: Examination of the restorations after exactly 6 years of clinical service time.

Figures 4 a-d:
Patient of Figures 2a-d, after exactly 6 years of clinical service time. On the figure 2b, «A» arrow shows a complication (partial fracture) on the first premolar; «B» arrow shows a failure as the composite restoration is absent.
Figures 5 a-b: 
Bite-wings radiographs of the patient showed in Figures 1 and 2

Figure 6: 
Kaplan-Meier survival analysis of all the restorations
Figures 7a-b: Clinical case examples:
«A» arrow shows a failure of a composite restoration on a 39 years old female patient after 4 years follow-up (i.e. missing restoration).
«B» arrow shows a failure of a composite restoration and «C» arrow a complication (partial fracture) on a 48 years old male patient after 4 years follow-up.

Figure 8: Clinical case example:
Arrows show a complication (fissures) in feldspathic veneers of a 51 years old male patient after 4 years follow-up. Those fissures were sealed with a bond coating after 1.5 year of service.
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<th>Material for restoration</th>
<th>Brand</th>
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<td>Resin composite (direct)</td>
<td>Tetric EvoCeram/EvoFlow (Ivoclar Vivadent, Schaan, Liechtenstein)</td>
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<td>Lithium disilicate</td>
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<p>| Total n anterior: | 83   | 0   | 147   | 26   | 71   | 46   | 4 |
| Total n posterior: | 66   | 110 | 32   | 40   | 10   | 28   | 0 |
| Total n superior: | 53   | 46   | 0   | 25   | 7   | 14   | 129 | 16   | 69   | 40   | 4 |
| Total n inferior: | 96   | 64   | 32   | 15   | 3   | 14   | 18   | 10   | 2   | 6   | 0 |
| Total n buccal: | 2     | 0    | 55    | 9    | 0    | 46    | 0 |
| Total n palatal: | 11    | 0    | 87    | 16    | 67   | 0    | 4 |
| Total n lingual: | 8     | 0    | 0     |       |       |       |   |
| Total n buccal and palatal: | 0     | 0    | 2     | 0    | 2    | 0    | 0 |
| Total n buccal and lingual: | 0     | 0    | 3     | 1    | 2    | 0    | 0 |
| Total n incisal: | 61    | 0    | 0     |       |       |       |   |
| Total n occlusal: | 51    | 82    | 31    | 36    | 1    | 14    | 0 |
| Total n occlusal and buccal: | 1     | 26    | 0     | 3     | 9    | 14    | 0 |
| Total n occlusal and interproximal: | 15    | 2     | 1     | 1     | 0    | 0    | 0 |</p>
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