Do Monolithic Zirconia Restorations Affect Temporomandibular Disorder Signs and Symptoms? Data From a Prospective Clinical Trial after 1 Year of Observation

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Purpose: To investigate the effect of monolithic zirconia–based occlusal surfaces on signs and symptoms of temporomandibular disorders (TMD) after short-term clinical service. Materials and Methods: Patients were supplied with multi-unit fixed dental prostheses (FDP) featuring monolithic zirconia–based occlusal surfaces. Prior to prosthetic treatment and 1 year after insertion, anamnestic facial pain, pain with palpation of muscles/joints, and joint sounds were examined. Results: Of the 50 patients, 43 were re-examined after 1 year. Perceived facial pain was not present, pain with palpation occurred in 2 patients, and TMJ sounds decreased, but the differences were not statistically significant (P ≥ .058). Conclusion: Single tooth–supported multi-unit FDPs featuring monolithic zirconia–based occlusal surfaces did not affect TMD-associated signs and symptoms. Int J Prosthodont 2021;34:448–450. doi: 10.11607/ijp.6983

As the demand for esthetic dental restorations steadily increases, the application of zirconia for the fabrication of fixed dental prostheses (FDP) has become popular. However, previous studies have indicated higher complication rates for veneered zirconia in comparison to metal-ceramic restorations, especially for chipping.1 Thus, the fabrication of prosthetic restorations from zirconia in a monolithic form appears to be favorable for avoiding technical complications. While wear is physiologic in natural tooth and other restorative materials, almost no wear is expected for well-polished zirconia-based surfaces and their antagonists.2 Thus, whether restorations fabricated from monolithic zirconia have a detrimental effect on the masticatory system has been critically discussed.3

With regard to these considerations, the purpose of the present study was to test the hypothesis that there is no effect of posterior FDPs with monolithic zirconia–based occlusal surfaces on signs and symptoms of TMDs after 1 year of clinical service.

MATERIALS AND METHODS

Between June of 2014 and July of 2018, patients requiring a single tooth–supported multi-unit FDP in the posterior area were consecutively recruited. The inclusion criteria were vital or successfully endodontically treated abutment teeth with a biologic width of ≥ 2 mm. The exclusion criteria were: xerostomia; pregnancy; insufficient oral
hygiene; multiple general diseases; FDPs with cantilever extensions; and patients with removable partial dentures supported by an FDP.

Patients were supplied with restorations fabricated from 3 mol% yttria-stabilized tetragonal zirconia that were either completely monolithic or facially veneered. The FDPs were designed to match the adjacent teeth and set in occlusion, which was controlled with an 8-μm-thick metal foil. The study was registered in the German Clinical Trials Register (Deutsches Register Klinischer Studien, DRKS00019935) and approved by the local ethical committee (135-17298-14-25082014).

Patients were screened for TMD signs and symptoms prior to prosthetic treatment and 1 year after insertion of the FDPs. For screening purposes, a single question (Do you have pain on the right side of your face, the left side, or both sides?) was used that predicts pain-related TMDs with a sensitivity of 96% and a specificity of 95%. Results are presented as “facial pain (anamnestic).” TMD signs were examined by trained dentists according to the recommendations of the Diagnostic Criteria for Temporomandibular Disorders (DC/TMD), including parts of the standard examination such as palpation of the temporal muscles, masseter muscles, lateral pole, around the lateral pole, and evaluation of temporomandibular joint (TMJ) sounds during vertical movements (click/crepitus). The palpation was performed with a pressure of 1 kg, except for the lateral pole (0.5 kg). For statistical analysis, results for the palpation of the temporal and masseter muscles were summarized as muscle pain, and results for the lateral pole and around the lateral pole as joint pain. The level of significance was set to .050 (SPSS version 24, IBM).

### RESULTS

Fifty patients (mean age: 57.3 ± 13.1 years, range: 29.3–80.2 years; 48.0% women) received a single tooth–supported multi-unit FDP in the posterior area (Fig 1), 90.0% of which were supported by two and 10.0% by three abutment teeth. Of the patients, 30.0% had natural or filled antagonistic teeth, 46.0% had full-coverage restorations, and 22.0% had a combination of both (MT). One patient had a partially missing antagonist tooth contact. The contralateral occlusion was categorized as the following: 30% natural/filled, 42.0% full-coverage, and 28% combination of both. Possible awake and/or sleep bruxism was observed in 14% of the patients.

Prior to treatment, 4.0% of the patients described facial pain. In 22.0%, a clicking sound was observed, and crepitus was observed in 6.0%. After 1 year of clinical service, none of the 43 participants who were recalled reported facial pain. Pain with palpation occurred in very few participants (n = 2), and TMJ sounds decreased. TMD signs and symptoms did not change significantly after 1 year (Wilcoxon signed-rank tests, all $P ≥ .058$; Table 1).

During the observational period, the status of the dentition had not changed with regard to the opposing and contralateral occlusion in any patient. Five patients who were lost for a 1-year recall could be examined at the 2-year recall (1.7 ± 0.3 years), and another participant at the 3-year recall (2.9 years). A newly occurring clicking sound was identified in one patient after 1.6 years, but for the remaining five patients, no TMD signs or symptoms were detected. One patient passed away before the 1-year follow-up and was registered as a dropout.

### Table 1  Frequency (%) of TMD Signs and Symptoms Before Treatment and at the 1-year Recall (n)

<table>
<thead>
<tr>
<th></th>
<th>Before treatment (n = 50)</th>
<th>1-year recall (n = 43)</th>
<th>$\rho^a$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facial pain (anamnestic)</td>
<td>2 (4.0)</td>
<td>0 (0.0)</td>
<td>.317</td>
</tr>
<tr>
<td>Pain with palpation of muscles</td>
<td>0 (0.0)</td>
<td>2 (4.7)$b$</td>
<td>.157</td>
</tr>
<tr>
<td>Pain with palpation of joints</td>
<td>0 (0.0)</td>
<td>1 (2.3)$b$</td>
<td>.317</td>
</tr>
<tr>
<td>Click</td>
<td>11 (22.0)$c$</td>
<td>4 (9.3)</td>
<td>.058</td>
</tr>
<tr>
<td>Crepitus</td>
<td>3 (6.0)$c$</td>
<td>0 (0.0)</td>
<td>.317</td>
</tr>
</tbody>
</table>

Data are reported as n (%).

$^a$Wilcoxon signed-rank test for 43 patients.

$^b$One patient was detected as positive for pain on palpation of both muscles and joints.

$^c$Both click and crepitus were observed in one patient.
DISCUSSION

The results of this investigation suggest that there is no effect of restorations with monolithic zirconia–based occlusal surfaces on TMD signs and symptoms. Thus, the null hypothesis of this investigation was not rejected.

During the observation time of the current study, joint sounds, especially clicking, decreased, but this decrease was not statistically significant. This observation corroborates results reported by other research groups who observed a disappearance of joint clicking after a couple of months.6,7 The authors assume that the following scenarios might account for this observation: disc displacement with reduction could have converted to disc displacement without reduction; the disc could have shown a (partial) reduction; adaption of the shape of the disc or the surrounding structures might have decreased the volume of the clicking sound; and/or variations during examination might have occurred due to the moderate reliability of joint sound assessments by palpation approaches.8

The limitations of the present study include the limited sample size, which can be explained by the strict inclusion criteria that only allowed the inclusion of patients requiring a single FDP. It would be interesting to elucidate whether more extensive or full-arch restorations feature similar results. It has yet to be proven whether data from longer observational periods reveal similar results. Within the limitations of the present study, single tooth–supported fixed restorations in the posterior area with occlusal surfaces fabricated from monolithic zirconia do not seem to affect the onset or progress of TMD signs and symptoms in the first year of clinical service.

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The authors report no conflicts of interest.

REFERENCES
