

# Evaluation of peri-implant bone levels and soft tissue dimensions around zirconia implants—a three-year follow-up study

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**Abstract.** The aim of this study was to measure bone levels around zirconia implants during follow-up of up to 3 years. Additionally, the effect of clinical contact point positions on the papilla deficit was evaluated. Eighty-one patients with 105 zirconia implants were examined at the 3-year follow-up. Bone levels were measured on the date of implant placement and at 3 months, 1 year, and 3 years thereafter. Distances between the first bone–implant contact and the contact point of the crowns and between the bone level at the adjacent tooth and the contact point of the crowns were assessed. The effect of the clinical contact point position on the papilla deficit was also assessed. Significant reductions in the distances between the bone–implant contact and the implant shoulder, as well as the contact point of the crowns, and between the bone level at the adjacent tooth and the contact point of the crowns, were found. A significant association was found between the papilla deficit and the height of the contact point. Implant survival was 100% and implant success was 95.4%. While zirconia implants presented little bone loss up to 1 year, significant bone apposition was observed up to 3 years. Low contact points correlated with full papillae, whereas high contact points were associated with a papilla deficit.

Key words: dental implant; ceramic; zirconium oxide; aesthetics; papilla; bone crest.

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Zirconia implants may have a better potential for biological and aesthetic success than titanium implants<sup>1–4</sup>. Owing to its tooth-like colour, zirconia can be used for aesthetically demanding prosthetic

reconstructions. However, evidence-based scientific data on the clinical application of zirconia dental implants are scarce. A clinical study demonstrated that immediate and delayed implant placement

showed aesthetic success at 1 year after placement of the prosthetic structure<sup>5</sup>. It is essential that peri-implant bone remains stable and that there is no bone loss, or very little, in order to maintain long-term

hard and soft tissue stability. Therefore, implant success criteria, such as those of Albrektsson et al., demand bone loss of less than 0.2 mm per year after the occlusal loading of implants<sup>6</sup>.

Recession of the hard tissue and gingival lining may lead to longer clinical crowns, resulting in a so-called 'black triangle' in the interdental space<sup>7-9</sup>. Stable peri-implant hard and soft tissue dimensions are preconditions for long-term implant success. Several clinical studies have assessed the influence of the distance between the alveolar crest and the contact point of the crowns on the papilla around titanium implants<sup>9-11</sup>. Large distances were found to be associated with papillary recession in the interdental space. Similarly, the first clinical study of zirconia implants showed that the distance between

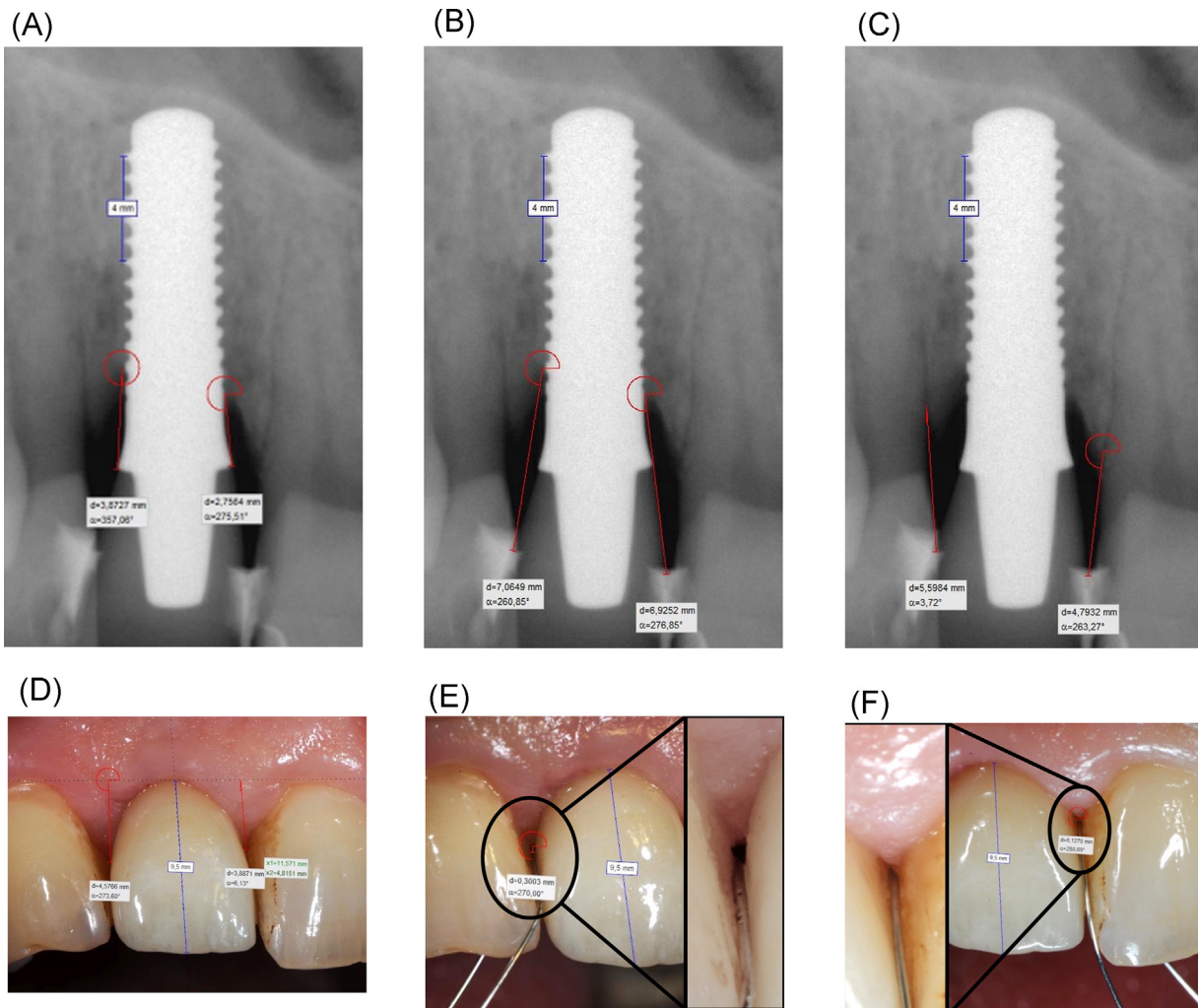
the bone crest at the implant and the contact point of the crowns was related to a full or missing papilla<sup>12</sup>. Chu et al. published data indicating that the ideal proportion of the papilla height to the clinical crown height is approximately 40% for all tooth groups<sup>13</sup>. Consequently, the ideal contact point position of the crown is at 40% of the height of the crown length. The contact point of the crown is more a proximal contact area, which increases with age due to abrasion<sup>14</sup>. Nevertheless, this proximal contact area determines the papillary and incisal embrasures.

The existing literature lacks information on contact point heights around dental implants, especially in aesthetic evaluations. Further assessments are therefore necessary, because the crown and inter-

dental morphologies of the hard and soft tissue dimensions have a strong influence on the papillary fill<sup>15</sup>. The aim of this study was therefore to measure the peri-implant bone level around zirconia implants during follow-up of up to 3 years. This study also assessed the effect of the clinical contact point position on the papilla deficit.

## Materials and methods

Patients with zirconia implants who had undergone prosthetic rehabilitation 3 years previously were included in this follow-up study. This prospective observational study was conducted in accordance with the STROBE statement (strengthening the reporting of observational studies in epidemiology)<sup>16</sup>.



*Fig. 1.* (A) Measurement of the distance between the first bone–implant contact and the implant shoulder (distance 1). (B) Measurement of the distance between the first bone–implant contact and the contact point of the crowns (distance 2). (C) Measurement of the distance between the bone level at the adjacent tooth and the contact point of the crowns (distance 3). (D) Measurement of the papilla deficit (distance 4). (E), (F) Papilla height assessment.

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