The Effect of Crown-to-Implant Ratio on the Clinical Outcomes of Dental Implants: A Systematic Review

Andrea Ravidà, DDS, MS1/Shayan Barootchi, DMD2/Aaeshah-Alkanderi, BMedSc, BDM2/Lorenzo Tavelli, DDS1/Fernando Suárez-López del Amo, DDS, MS2

Purpose: To analyze the effect of crown-to-implant (C/I) ratio over survival rate, marginal bone loss, and prosthetic complications of dental implants. Materials and Methods: Electronic (PubMed [MEDLINE], Embase, and Cochrane Central) and manual searches for clinical trials with a minimum follow-up of 1 year were performed. Clinical and anatomical C/I ratios were obtained. Regression models were created to assess for potential correlation between C/I ratio (anatomical and clinical) and survival rate, marginal bone loss, or prosthetic complications. A subgroup analysis of 6-mm implants and a comparison of C/I ratios of > 1.5 vs ≤ 1.5 were also performed. The Newcastle-Ottawa Scale and Cochrane Risk of Bias Tool For Randomized Controlled Trials were used to evaluate the risk of bias. Results: An overall moderate risk of bias was assessed among the selected articles. Linear regression analysis did not reveal a significant correlation between anatomical C/I ratios and survival rate (P = .905), marginal bone loss (P = .33), or prosthetic complications (P = .67). Similarly, no significant correlation to survival rate and marginal bone loss (P = .42, P = .84) was observed in the articles providing the clinical C/I ratios. Conclusion: Increased C/I ratio does not seem to be directly related with increased marginal bone loss and does not represent a biomechanical risk factor for the stability of the prosthesis and for the survival of dental implants. Int J Oral Maxillofac Implants 2019;34:1121–1131. doi: 10.11607/jomi.7355

Keywords: crown-to-implant ratio, dental implants, evidence-based dentistry, peri-implant bone loss, short implants
implants when compared with short implants after 5 years of follow-up. Moreover, although not strictly related with the sole use of short dental implants, unfavorable crown-to-implant (C/I) ratios have often been reported as a consequence of implants with reduced length.

C/I ratio represents the relationship of the height of the crown to the length of the implant, and it can be evaluated clinically and anatomically (Fig 1). While the presence of unfavorable C/I ratios in teeth has been observed as a detrimental factor for the stability of the dentition over time, several investigations have failed to demonstrate a detrimental effect of this parameter on the number of biologic and prosthetic complications.

The field of implant dentistry continues to seek the local and systemic factors that can reduce or eliminate marginal bone loss and minimize the incidence of complications and increase the success rate and long-term stability. As such, the comprehensive understanding of the role of C/I ratio on the maintenance of the marginal bone is of paramount importance. Similarly, prosthetic complications and survival rate could also be influenced by different magnitudes of C/I ratios. Hence, the purpose of this study was to investigate the effect of C/I ratio on implant survival, marginal bone loss, and prosthetic complications.

**MATERIALS AND METHODS**

**Study Registration**
The protocol of the present article has been registered in PROSPERO under the identification number (CRD42018092665).

**Reporting Format**
The 27-item Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement was utilized. The Assessment of Multiple Systematic Reviews guidelines (AMSTAR) was followed to meet the predetermined criteria of reporting in systematic reviews.

**Patient, Intervention, Comparison, Outcome (PICO) Question**
The following PICO question was formulated to address the specific aim of the study: In partially edentulous patients requiring implant placement for support of the definitive prosthesis, how are clinical parameters such as survival rate, marginal bone levels, and the occurrence of prosthetic complications affected by a low C/I ratio compared with a higher C/I ratio?

**Screening Process and Information Sources**
A broad search of the literature was conducted electronically and manually by two separate authors (A.R., A.A.), without date limit. Three databases were used to conduct a computerized and systematic search until March 2018:

**MEDLINE:**
- COCHRANE: Short dental implants AND Trials.

Furthermore, the Medicine Gray Literature Report was screened for ongoing/unpublished trials, and a search of all the articles published in implantology-related journals and periodontal journals from January 2017 to March 2018 was completed to guarantee the
inclusion of all the eligible articles. Previous systematic reviews and meta-analyses related to short implants and C/I ratio were also scrutinized for identification of further articles. Interreviewer agreement was evaluated for the title and abstract identification using κ statistic.

Eligibility Criteria
Studies were selected only when they met the following criteria: (1) prospective cohort study and randomized clinical trial reporting on the C/I ratio as a study outcome; (2) patient followed for a minimum of 12 months; (3) articles including partially edentulous patients receiving ≥ 1 dental implants. The exclusion criteria were: (1) articles with a follow-up of < 12 months after prosthetic loading; (2) fully edentulous patients receiving a full-arch rehabilitation; (3) animal studies; (4) case series, case reports, retrospective studies, and systematic reviews.

Data Extraction and Statistical Analysis
During the first phase of the data extraction, screening was performed by two independent authors (A.R., A.A.), and articles were excluded according to titles and abstracts. In the second stage of the process, the same reviewers performed full-text evaluation based on the aforementioned inclusion and exclusion criteria. If inconsistencies were present in the data extraction, a third author (F.S.) was consulted for reaching consensus. Data such as clinical outcomes, patient characteristics, and treatment covariates were collected and systematically analyzed. Anatomical C/I was considered as the ratio of a perpendicular distance from the most coronal aspect of the crown to the implant shoulder to perpendicular distance from the implant shoulder to the most apical aspect of the implant. Clinical C/I ratio was defined as the perpendicular distance from the implant shoulder to the first visible apical bone-to-implant contact on the mesial and distal aspects of the implant to a perpendicular distance from the first visible apical bone-to-implant contact to the most apical aspect of the implant. All analyses were performed using statistical software for Macintosh (Rstudio Version 1.1.383, Rstudio). In summary, linear regression models were created to correlate the effects of different anatomical C/I ratios to the outcomes of survival rate, marginal bone loss, and prosthetic complications, while adjusting for the variability in the percentage of smokers, studies with soft tissue–level implants vs bone-level implants, and the different follow-up times among studies. For a more equitable and precise methodology, in marginal bone loss regression analyses, studies were weighted according to the inverse variance of the mean (of the reported marginal bone loss in each arm/study), whereas for survival rate analyses, the weight was based on the number (n) of the sample size (implants) in each arm/study. Hence, if a study did not provide the SD for the marginal bone loss (MBL) or the exact number in which the survival rate was based upon, it had to be excluded from the statistical reporting. Confidence intervals were calculated for the fitted parameters in each regression model, and a P value of 5% or below was assumed to be statistically significant. Additionally, the generated models were plotted to visualize the pattern and effect in different C/I ratios to the studied outcomes utilizing the package ggplot2. Studies were divided into C/I above 1.5 vs ≤ 1.5 to study the outcomes of survival rate, marginal bone loss, and prosthetic complications among both groups. Furthermore, a subgroup analysis was performed for only extra-short implants (6 mm) to assess the effect of different crown heights on all the aforementioned outcomes (survival rate, marginal bone loss, and prosthetic complications).

Subgroup analyses were performed by grouping the studies based on the median follow-up time. Lastly, whenever possible, the effect of screw vs cemented, splinted vs nonsplinted restorations on survival rate, marginal bone loss, and prosthetic complications, and the effect of smoking on survival rate and marginal bone loss were explored. All the previously described analyses were performed separately for both anatomical and clinical ratios with the exclusion of prosthetic complications for clinical C/I ratio (due to lack of information). Also, the influence of C/I ratio on biologic complications could not be analyzed due to insufficient information. Lack of information also prevented further analysis of implants based on whether or not bone augmentation procedures were performed.

Risk of Bias and Qualitative Assessment
Full-text articles were scrutinized to analyze the risk of bias of the prospective cohort studies according to the Newcastle-Ottawa Scale. Quality assessment of all the randomized controlled trials (RCTs) was evaluated using the Cochrane Risk of Bias Tool for Randomized Controlled Trials and the included articles were classified as low, moderate, or high risks based on the quality of their methodology. For the selected RCTs, studies were categorized as having a low risk of bias if they provided detailed information regarding all the parameters stated in the aforementioned scale. Additionally, a moderate risk of bias was assigned for studies that did not provide data on only one of the parameters, and a high risk of bias if a study did not show information on ≥ 2 parameters. For the controlled prospective studies, the Newcastle-Ottawa Scale was used to assess their quality and bias according to the number of stars achieved by an article depending on the information provided. Studies
obtaining below five stars were categorized as having a high risk of bias, studies with five and six stars were grouped as having a moderate risk of bias, and seven or more stars were categorized as having a low risk of bias.

RESULTS

Study Selection
During the initial screening, 649 articles were included (245 PubMed [MEDLINE]; 275 EMBASE; 123 Cochrane; 6 manual search). After evaluation of titles and abstracts, 120 articles were selected, from which 105 were discarded after full-text reading (Appendix Table 1; see online version of this article at quintpub.com), leaving 15 articles included in the final analysis (Fig 2). The κ value for agreement between the reviewers was 0.87 (title and abstract) and 0.85 (full-text articles).

Assessment of Risk of Bias
The results of the risk of bias for the selected RCTs are summarized in Fig 3. Overall, one article55 was categorized as high risk of bias and four articles were rated as having a moderate risk of bias.19–21,56 None of the included articles were categorized as having a low risk of bias. The results from the 10 articles evaluated with the Newcastle-Ottawa Scale risk of bias are illustrated in Table 1.

Characteristics of the Included Articles
In terms of study design, out of the 15 selected articles,19–23,55–64 10 were prospective cohort 22,23,57–64 and 5 were RCTs.19–21,55,56 Thirteen articles were performed in a single center,19–23,57–64 while only two were conducted in multiple centers.55,56

Population Characteristics
The characteristics of all the selected articles are described and summarized in Table 2. For the present review, a total of 907 patients (ranging from 12 to 136), with an average of 45 individuals per study were studied. The estimation of the exact number of male and female patients was not possible since two articles59,65 did not report information in this regard. Out of the 15 selected articles, smokers were not allowed to participate in one,58 while three did not specify the number of smokers.22,59,64 Among the rest, the percentage of smokers in the total sample ranged from 8%56 to 38.5%.20
Implant Location, Dimensions, and Characteristics
Overall, 1,548 implants were analyzed. Among the different systems, 6-mm soft tissue–level Straumann implants were the most commonly employed, being used in six articles. The remaining investigations used the following manufacturers: SPS implants, ITI, Astra Tech, Nobel, Endopore Dental System, and Leone Implant system. The length of the implants ranged from 5 to 10 mm and the diameter from 4 to 4.8 mm. An external implant-abutment connection was employed in two articles, while the rest employed internal connections. The type of restoration was evaluated in three articles. Screw-retained were utilized in three articles, while six studies used both types. Nonstandardized periapical radiographs using the paralleling technique were employed in eight articles, while five utilized standardized ones. In only one article, radiographs were obtained using computed tomography (CT) scans. Additionally, in all the selected trials, the presence of antagonist dentition was observed.

Anatomical C/I
Fifteen articles reported the anatomical C/I and provided data on marginal bone loss, survival rate, and prosthetic complications.

Survival Rate
Linear regression analysis did not show a significant correlation between survival rate and anatomical C/I ratio among the included investigations. The coefficient of C/I ratio from the linear model was -0.215 (95% CI [-3.96, 3.53], P = .905), and the difference in follow-up time of studies did not seem to significantly affect the results (P = .65) (Fig 4a). Other variables such as type of restorations, screw vs cemented crowns (2.045 [95% CI (–2.72, 6.81)], P = .35), splinted or not splinted prosthesis (1.02 [95% CI (–5.17, 7.22)], P = .72), and smoking (0.02 [95% CI (–0.11, 0.16)], P = .65) did not show a significant correlation to survival rate in articles with varying C/I ratios.

Marginal Bone Loss
When the effect of C/I ratio to the outcome marginal bone loss was investigated, no significant correlation was observed (coefficient of 0.136 [95% CI (–0.15, 0.42)], P = .33) (Fig 4b). However, time itself proved to be a significant predictor to marginal bone loss in the regression model (coefficient value of 0.005 [95% CI (0.003, 0.01)], P = .03). Finally, the type of retention (–0.14 [95% CI (–0.41, 0.11)], P = .23), splinting (0.05 [95% CI (–0.14, 0.24)], P = .56), and smoking (0.001 [95% CI (–0.007, 0.01)], P = .81), did not show statistical significance affecting the marginal bone loss when correlated with different C/I ratios.

Prosthetic Complications
Regression analysis failed to prove a significant association between the cumulative prosthetic complications among studies and the anatomical C/I ratio (estimated coefficient 1.16 [95% CI (–4.91, 7.24)], P = .67) (Fig 4c). Furthermore, type of retention (–11.12 [95% CI (–24.84, 2.59)], P = .07), splinting (2.58 [95% CI (–7.5, 12.67)], P = .54), and smoking (0.19 [95% CI (–0.34, 0.72)], P = .41) did not reach a statistically significant effect on the total amount of technical complications.

Clinical C/I
The potential correlation of the different clinical C/I ratio on survival rate, marginal bone loss, and prosthetic complications was explored with nine articles.

Survival Rate
For articles providing the clinical C/I ratio, regression analysis did not demonstrate a significant correlation with survival rate (estimated coefficient 2.65 [95% CI

<table>
<thead>
<tr>
<th>Overall risk</th>
<th>Random sequence generation</th>
<th>Allocation concealment</th>
<th>Blinding of participants and personnel</th>
<th>Blinding of outcome assessment</th>
<th>Incomplete outcome data addresses</th>
<th>Selective reporting</th>
<th>Other biases</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Moderate</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Moderate</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Moderate</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Moderate</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

Fig 3 Risk of bias assessment for included RCTs according to the Cochrane recommendations. Green = high risk; gray = unclear risk; black = low risk.
Marginal Bone Loss

In terms of marginal bone loss, no statistical significance was reached when correlated with different clinical C/I ratios (estimated coefficient $-0.02 \ [95\% CI (-0.29, 0.46)]$) when controlled for the different follow-up periods among studies (Fig 5a). Similarly, smoking habit ($0.08 \ [95\% CI (-0.29, 0.46)]$) was not associated with survival rate ($P = .06$).
CI (–0.34, 0.28), P = .84) (Fig 5b). Contrarily, follow-up time proved to be a significant predictor for marginal bone loss (estimated coefficient −0.005 [95% CI (−0.008, −0.001)], P = .009). As noted with anatomical C/I ratio, smoking did not influence the amount of marginal bone loss for the clinical C/I ratio (P = .19).

Analysis of Outcomes Based on Higher than 1.5 vs 1.5 or Lower C/I
When studies were divided based on anatomical C/I ratio of more than 1.5 vs 1.5 or less, a statistically significant correlation was observed for marginal bone loss, in favor of the former C/I (> 1.5), with an estimated coefficient of 0.63 (95% CI [0.03, 1.23], P = .039) (Fig 6). The outcomes of survival rate (−3.01 [95% CI (−8.67, 2.64)], P = .27) and prosthetic complications (7.17 [95% CI (−14.74, 29.1)], P = .46), however, did not seem to be statistically associated and remained unaffected in this subgroup analysis.

Effect of the Different Crown Lengths in 6-mm Extra-Short Implants
Subgroup analysis of extra-short (6-mm) implants when controlling for the different follow-up times of trials failed to demonstrate a statistical correlation of anatomical C/I ratio (different crown height) with the outcomes of survival rate (4.74 [95% CI (−10.49, 19.98)], P = .45), marginal bone loss (0.53 [95% CI (−0.33, 1.41)], P = .17), and prosthetic complications (0.83 [95% CI (−26.73, 28.35)], P = .93).

DISCUSSION
The medical field has always focused on patient-centered minimally invasive surgical procedures. Similarly, in the field of implant dentistry, the use of short implants as an alternative to more invasive surgical procedures has gained popularity in the last decades, demonstrating satisfactory clinical and patient-reported outcomes.17,55 Despite an initial negative notion of short implants in regard to occlusion, neither finite element analysis nor clinical studies have found correlation between the utilization of such implants and increased bone loss caused by excessive occlusal forces.3,55,67 Indeed, a recent study by Piccinini and coworkers showed that high forces applied on implants lead to a radiologically denser peri-implant bone in rats.68 Similarly, in a 3-year RCT, Sahrmann and coworkers reported a higher degree of mineralization around short implants when compared with longer implants.69

In the present review, the density of the peri-implant bone could not be evaluated; nevertheless, key factors for successful implant therapy were investigated (eg, survival rate, marginal bone loss, prosthetic complications). In addition, a comparison of studies with C/I ratio values above or below a specific cutoff point (1.5) was performed. This specific value was chosen for analysis based on a recent study that suggested a cutoff point for implants at which it could potentially increase the risk for an increase in marginal bone loss.60 Furthermore, when splinted vs nonsplinted restorations and their potential influence on C/I ratio and marginal bone loss were explored, no statistically significant correlation was found. Although a recent in vitro study showed that splinting two or more crowns in extra-short implants with high C/I ratio may lead to a better load sharing (especially when oblique load was...
In terms of marginal bone loss, the results obtained in this study differed from a previous systematic review concluding that within the range of 0.6/1 to 2.36/1, the higher the C/I ratio, the less the peri-implant marginal bone loss. However, this trend has also been observed in the present investigation when articles with C/I ratios of ≤ 1.5 were compared with values of > 1.5, with the latter showing statistically significantly less bone loss. The differences in the results of the regression between the two studies may initially be dictated by the addition of several new investigations that allowed for an analysis of more than 1,000 implants, and second, by the inclusion of only prospective studies and the separation of the C/I ratios into clinical and anatomical. The separate analyses of these two concepts is fundamental since in the clinical ratio, the fulcrum is located at the most coronal bone-to-implant contact, while in the anatomical, it is located between the crown-abutment complex and the shoulder of the implant.

Previously, a direct relationship between increased prosthetic complications and C/I ratio was reported by in vitro (finite element analysis) investigations establishing a destructive effect of the high crown height, especially under oblique forces. Indeed, Bulaqi and coworkers concluded that in the case of high C/I ratios, nonaxial forces contribute to an increased rate of screw loosening, confirming the results previously reported by Moraes and colleagues. Biomechanically, a higher number of prosthetic complications with increased C/I ratio could be explained by the augmented “micro-rotation/rocking”, due to the longer occlusal height arm produced by the large prosthesis. In this review, the occurrence of prosthetic complications related with different C/I ratios has also been systematically addressed for the first time; however, no correlation has been found between higher C/I ratios and increased number of prosthetic complications, which may be explained by the vast heterogeneity among articles. A good representation of such phenomenon are the two included investigations with similar C/I ratios of 1.1 and 1.2 employing 6-mm-long implants.

### Table 2 Characteristics of the Included Articles

<table>
<thead>
<tr>
<th>Study/year</th>
<th>Study design</th>
<th>Patients (n)</th>
<th>Implants (n)</th>
<th>Follow-up (mo)</th>
<th>SR (%)</th>
<th>MBL SD (mm)</th>
<th>Implant length (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blanes et al, 2007</td>
<td>PC</td>
<td>83</td>
<td>192</td>
<td>120</td>
<td>97.9</td>
<td>0.24 ± 1.16</td>
<td>6, 8</td>
</tr>
<tr>
<td>Deporter et al, 2012</td>
<td>PC</td>
<td>24</td>
<td>48</td>
<td>120</td>
<td>95.5</td>
<td>1.25 ± 0.575</td>
<td>7–9</td>
</tr>
<tr>
<td>Ghariani et al, 2016</td>
<td>PC</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>100</td>
<td>0.187 ± 0.161</td>
<td>5, 7, 9, 12</td>
</tr>
<tr>
<td>Guijé et al, 2013</td>
<td>RCT</td>
<td>49</td>
<td>107</td>
<td>12</td>
<td>97.2</td>
<td>0.2 ± 0.22</td>
<td>6</td>
</tr>
<tr>
<td>Hingsammer et al, 2017</td>
<td>PC</td>
<td>28</td>
<td>72</td>
<td>20.52 (survival)</td>
<td>12.38 (bone loss)</td>
<td>97.3</td>
<td>0.71 ± 0.74</td>
</tr>
<tr>
<td>Malchiodzi et al, 2014</td>
<td>PC</td>
<td>136</td>
<td>259</td>
<td>36</td>
<td>98.8</td>
<td>0.48 ± 0.29</td>
<td>5, 7, 9, 12</td>
</tr>
<tr>
<td>Mangano et al, 2016</td>
<td>PC</td>
<td>51</td>
<td>68</td>
<td>60</td>
<td>97</td>
<td>0.41 ± 0.75</td>
<td>6.5</td>
</tr>
<tr>
<td>Pieri et al, 2012</td>
<td>PC</td>
<td>25</td>
<td>50</td>
<td>24</td>
<td>96.8</td>
<td>0.60 ± 0.13</td>
<td>6</td>
</tr>
<tr>
<td>Pohl et al, 2017</td>
<td>RCT</td>
<td>45</td>
<td>61</td>
<td>36</td>
<td>100</td>
<td>0.44 ± 0.56</td>
<td>6</td>
</tr>
<tr>
<td>Romeo et al, 2014</td>
<td>RCT</td>
<td>26</td>
<td>11</td>
<td>60</td>
<td>96</td>
<td>0.43 ± 0.34</td>
<td>6</td>
</tr>
<tr>
<td>Rossi et al, 2015</td>
<td>PC</td>
<td>35</td>
<td>40</td>
<td>60</td>
<td>95</td>
<td>0.7 ± 0.6</td>
<td>6</td>
</tr>
<tr>
<td>Rossi et al, 2016</td>
<td>RCT</td>
<td>30</td>
<td>30</td>
<td>60</td>
<td>96.7</td>
<td>0.14 ± 0.7</td>
<td>6</td>
</tr>
<tr>
<td>Tawil et al, 2006</td>
<td>PC</td>
<td>109</td>
<td>262</td>
<td>53</td>
<td>99.24</td>
<td>0.74 ± 0.65</td>
<td>≤ 10</td>
</tr>
<tr>
<td>Villarinho et al, 2017</td>
<td>PC</td>
<td>20</td>
<td>46</td>
<td>48</td>
<td>91.3</td>
<td>0.6 ± 0.13</td>
<td>6</td>
</tr>
<tr>
<td>Naenni et al, 2018</td>
<td>RCT</td>
<td>41</td>
<td>47</td>
<td>60</td>
<td>91</td>
<td>0.43 ± 0.91</td>
<td>6</td>
</tr>
</tbody>
</table>

SR = Survival rate; MBL = mean marginal bone loss; PC = prospective cohort; RCT = randomized clinical trial; Mx = maxilla; Mn = mandible; S = screw-retained; C = cement-retained; Sp = Splinted; NSp = nonsplinted.
(Straumann soft tissue level). In the first study,21 13 out of 46 crowns (28.3%) reported screw loosening, while in the second study,22 no prosthetic complications were found. Furthermore, a 1-year RCT by Guljé and coworkers comparing splinted 6-mm extra-short implants (C/I ratio of 1.83) and 10-mm-long implants (C/I ratio of 0.93) found two times more complications in the long implant group than in the short.56 The prosthetic complications around implants are then likely to be related with other factors (splinting of the crowns, the material of the prosthesis, parafunctional habits, and opposite dentition, among others) playing a greater role than the ratio between the implant and the crown in the stability of the prosthesis. Hence, these highly contrasting results reported in the literature suggest that the C/I ratio could be an often-misinterpreted concept since it is not consistently related with increased marginal bone loss, as many articles did not properly report such information.

### CONCLUSIONS

Within the limitations of this study and the results of the statistical analyses, it can be concluded that an increase of C/I ratio does not seem to directly affect implant survival, marginal bone loss, or overall prosthetic complications.

### ACKNOWLEDGMENTS

The authors have no direct or indirect financial interests, either in the products or the information listed in the paper. The authors reported no conflicts of interest related to this study.
REFERENCES


42. Kwon T, Bain PA, Levin L. Systematic review of short (<5-10 years) and long-term (10 years or more) survival and success of full-arch fixed dental hybrid prostheses and supporting implants. J Dent 2014;42:1228–1241.
### Appendix Table 1  Excluded Articles

<table>
<thead>
<tr>
<th>Reason</th>
<th>Publications (Date)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 10 patients</td>
<td>Shibuya et al. 2010</td>
</tr>
<tr>
<td>Recent publication with longer follow-up available</td>
<td>Rossi et al. 2010</td>
</tr>
</tbody>
</table>