The Immediate Placement of Dental Implants Into Extraction Sites With Periapical Lesions: A Retrospective Chart Review

Christopher Lincoln Bell,* David Diehl,† Brian Michael Bell,‡ and Robert E. Bell, DDS§

Purpose: The purpose of this study was to evaluate the success of dental implants placed immediately into extraction sites in the presence of chronic periapical pathology.

Materials and Methods: The charts of 655 patients who had implants immediately placed into fresh extraction sites were reviewed for the presence or absence of periapical radiolucencies. A total of 922 implants were included. Of the 922 implants, 285 were immediately placed into sockets that had chronic periapical infections. The remaining 637 implants, without signs of periapical pathology, were used as the control group. Success of the implants was defined as successful osseointegration, successful restoration, and absence of evidence of bone loss or peri-implantitis. Other variables such as age, gender, smoking, diabetes, bisphosphonate use, lucencies of adjacent teeth, and implant stability at the time of placement were also evaluated.

Results: Of the 922 implants, 285 were placed into sockets with periapical radiolucencies. The success rate of implants placed in the study group was 97.5%, whereas the success rate of the control group was 98.7%. The difference was not found to be statistically significant. The mean follow-up was 19.75 months, with a maximum of 93 months and a minimum of 3 months. A statistically higher failure rate was found for implants placed adjacent to retained teeth with periapical pathology.

Conclusions: The placement of implants in sockets affected by chronic periapical pathology can be considered a safe and viable treatment option. There is a risk of implant failure when placing implants adjacent to teeth with periapical radiolucencies.

Dental implants are a well-established treatment option to restore function in edentulous and partially edentulous patients. The original procedure for endosseous cylindrical implants as described by Bråemark and colleagues1 called for implants placed in healed bone and submersion of the implants for extended unloaded healing periods. Over time, implant surgery has evolved, and currently, implant placement into fresh extraction sites in a 1-stage fashion has proven to be a viable surgical option.2,3

There are some obvious advantages to the placement of implants at the time of extraction including decreased number of surgical interventions, decreased healing time, and possible improved maintenance of alveolar architecture.4,5 Gordon L. Douglas stated that immediate implants ought to have 3- and 4-walled sockets, minimal periodontal bone resorption, sufficient bone to stabilize the implant, and minimal circumferential defects. As long as these prerequisites were met, immediate placement could be considered a safe and viable procedure.6 In a retrospective study performed by Schwartz-Arad and Chaushu,2 95 immediately placed implants were studied over a period of 5 years, having a success rate of approximately 95%. Schwartz-Arad and Chaushu con-
cluded that, following specific protocols, immediate placement of implants was a viable option.

It has been shown that implants can be placed successfully into fresh extraction sites. However, can implants be safely placed in chronically infected extraction sockets? Several authors have stated that extraction sites should be infection free to place immediate implants.7,8 In a study of 30 partially edentulous patients, 61 transmucosal implants were placed immediately in sites with chronic periapical lesions. Of those implants, only 1 failed, for a success rate of 98.4%. Del Fabbro et al9 concluded that immediate implant placement in the presence of chronic periapical infection could be considered a safe, effective, and predictable treatment option. Crespi et al10 studied 15 patients with periapical lesions who underwent immediate implant placement. Fifteen patients with single-tooth extractions and no periapical pathology served as the control. Clinical parameters such as probing depth, modified plaque index, modified bleeding index, marginal gingiva level, keratinized mucosa, and marginal bone levels were evaluated at baseline and at 12 and 24 months after implant placement. Both study groups had a survival rate of 100%. Several other studies have been performed with similar results.11-14 The sample size of these investigations has been relatively small. The purpose of this retrospective chart review is to explore the viability of immediately placed implants into extraction sites with radiolucencies in a large cohort of patients.

Materials and Methods

Patient records from a private oral surgery office were reviewed for all patients having extraction and immediate implant placement. Two independent evaluators reviewed radiographs and chart notes of patients dating from January 2001 to February 2009. While examining radiographs, the evaluators were blinded as to whether implants had failed. Parameters that were evaluated included the following: the presence or absence of periapical radiolucencies on preoperative Panorex or CT radiographs, preoperative symptoms, the presence of preoperative soft tissue swelling, implant stability, tooth number and type, graft type, radiolucencies present on adjacent teeth, healing time, patients’ esthetic complaints, pocket depth, postoperative pain or infections, bisphosphonate use, smoking habits, age, gender, and other existing medical conditions such as diabetes. Chronic periapical pathology was defined for the purpose of this study as a radiographically visible periapical lucency on a tooth with carious pulpal exposure or evidence of a failed root canal that was not, per our records, associated with acute pain or soft tissue swelling. These data were collected and stripped of identifiers before evaluation. Major variables were subjected to a $\chi^2$ or z score statistical analysis. Only variables with $P < .05$ were considered statistically significant. The internal firewalls used exempt this study from institutional review.

Implant procedures were performed by a single operator in a private practice setting. Implants were not placed in patients with soft tissue swelling or acute pain. The implant placement protocol consisted of a preoperative Peridex oral rinse (3M ESPE Dental Products, St Paul, MN) and 600 mg of intravenous (IV) clindamycin. In clindamycin-allergic patients, 2 g of IV ampicillin was substituted. Teeth were typically extracted with forceps or were sectioned and carefully removed with elevators, with care taken to preserve surrounding bone. The periapical area was then debrided with a curette and irrigated. Osteotomies were performed via standard protocols in all cases, including surgical stents, slow-speed sequential drills, and copious irrigation. Strauman tissue or bone-level SLA (Strauman Dental Implants, Basel, Switzerland) implants were placed into the prepared osteotomies. Implant stability was monitored and noted upon placement. Residual sockets were grafted with platelet-rich plasma (prp) and 100% bone retrieved from a bone filter used during the osteotomies or with a combination of bone, xenograft, and prp. Implants were left exposed. If a residual socket greater than 1 mm remained after the suturing, Collatape (Zimmer Dental, Carlsbad, CA) soaked in prp was placed over the bone graft to promote soft tissue healing. Implants were loaded after a 3-month healing period.

Results

In total, 922 implants were placed in 655 patients (Figs 1-7). A total of 477 patients had 637 implants placed into extraction sites that were not affected by periapical radiolucencies. Of these 637 implants, 8 failed, for a success rate of 98.7% (Table 1). In 256 patients, a total of 285 implants were placed into extraction sites with periapical pathology. Of those 285 implants, 7 failed, for a success rate of 97.5%. The difference between the control group and the group with periapical radiolucencies was not statistically significant. None of the patients had preoperative soft tissue swelling. The mean follow-up was 19.75 months (range, 3-93 months).

Of the implants, 356 were placed in the mandible: 102 anterior teeth, 99 bicuspid, and 155 molars (Figs 5-7). Of these, 1 anterior (0.98%), 1 bicuspid (1.0%), and 2 molars (1.3%) failed. The remaining 566 implants were placed in the maxilla: 270 anterior teeth (Figs 1-4), 203 bicusps, and 93 molars. Of these, 5 anterior teeth (1.8%), 5 bicusps (2.4%), and 1 molar (1.3%) failed. The difference in the failure rate of the various surgical sites in the study and control groups was not found to be statistically significant.

There were 98 implants restored with locators, 133 bridge abutments, and 691 single-tooth restorations. Of the implants that failed, 12 were single-tooth implants, 2 were bridge abutments, and 1 had a locator attachment, yielding a failure rate of 1.7% for single-tooth implants, 1.5% for bridge abutments, and 1.0% for those with locator attachments. The differences in failure rates were not statistically significant for type of prosthesis.

Of the implants, 123 were placed in smokers, 46 in the study group, and 77 in the control group. Of the 46 implants with radiolucencies, 2 (4.3%) were lost compared with 1 (1.2%) in patients without radiolucencies. The results were not statistically significant.
Twenty-four of the implants were placed in patients taking bisphosphonates; of those, six had periapical radiolucencies. No implants failed in these patients.

Placement of 83 implants was performed in diabetic patients, 23 with radiolucencies and 60 without radiolucencies. All of the implants were successful.

The initial stability of the implants was evaluated, and the mean stability of the study and control groups was subjected to a z score analysis and was not found to be significant. Torque values ranged from 5 to 45 N-cm, with mean values of 30.5 N-cm and 35 N-cm in the study and control groups, respectively. Interestingly, the failed implants in the control group had a mean initial torque of 23.3 N-cm compared with 28.6 N-cm in failed implants in the study group. However, this was not found to be statistically significant, possibly because of the small sample size.

The mean size of lucencies was 2.5 mm. The mean size of radiolucencies within sockets where implants failed was 2.4 mm; the difference between the two was not statistically significant.

In total, 51 implants were placed adjacent to retained teeth with periapical radiolucencies, 21 in the study group and 30 in the control group. Of the 51 implants placed, 4 failed. All 4 of the failed implants were in the lucency group, giving an 81% success rate in the study group compared with 100% in the control group. Thus implants placed in sockets with lucencies adjacent to retained teeth with lucencies had a significantly higher failure rate.

We found that 2 patients (0.7%) in the study group had postoperative infections compared with 6 patients (0.1%) in the control group, which was not significant. No instances of implant periapical lesions were detected.

There were 125 implants placed in men and 160 placed in women in the study group and 258 implants placed in men and 279 placed in women in the control group. The mean age was 58.4 years in the study group and 60.1 years in the control group. There was no correlation between age or gender and implant failure.

The mean time between implant placement and implant failure was 2.9 months (range, 1-10 months).

A review of the chart notes showed no esthetic complaints.

Table 1. RESULTS

<table>
<thead>
<tr>
<th>Variable</th>
<th>No. of Implants</th>
<th>No. of Failures</th>
<th>Success Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>No radiolucency</td>
<td>657</td>
<td>8</td>
<td>98.7%</td>
</tr>
<tr>
<td>Periapical radiolucency</td>
<td>285</td>
<td>7</td>
<td>97.5%</td>
</tr>
<tr>
<td>Molars with lucency</td>
<td>90</td>
<td>2</td>
<td>97.8%</td>
</tr>
<tr>
<td>Molars without lucency</td>
<td>248</td>
<td>1</td>
<td>99.6%</td>
</tr>
<tr>
<td>Non-molars with lucency</td>
<td>194</td>
<td>5</td>
<td>97.4%</td>
</tr>
<tr>
<td>Non-molars without lucency</td>
<td>390</td>
<td>7</td>
<td>98.2%</td>
</tr>
<tr>
<td>Smokers with lucency</td>
<td>46</td>
<td>2</td>
<td>95.7%</td>
</tr>
<tr>
<td>Smokers without lucency</td>
<td>77</td>
<td>1</td>
<td>98.8%</td>
</tr>
<tr>
<td>Tooth with lucency adjacent to tooth with lucency</td>
<td>21</td>
<td>4</td>
<td>81.0%</td>
</tr>
<tr>
<td>Bisphosphonate-taking patients with lucency</td>
<td>6</td>
<td>0</td>
<td>100%</td>
</tr>
<tr>
<td>Diabetic patients with lucency</td>
<td>23</td>
<td>0</td>
<td>100%</td>
</tr>
</tbody>
</table>

Discussion

This study involved 655 patients and 922 implants. Each implant was placed immediately after the extraction of the tooth. Every implant was placed by a similar procedure. Each variable mentioned was also tested with either a χ² test or z score test to determine...
statistical significance. It was considered statistically significant only if the $P$ value was less than .05.

All patients received IV antibiotics, and the extraction site for every implant was debrided and irrigated. It is unknown whether these antibiotics had an effect on implant survival in this study because all study patients received them. Implants were not placed in patients with soft tissue swelling or acute pain, and this study does not, therefore, support placement of implants in patients with acute symptoms.

The only variable that significantly affected the outcome in this study was the presence of periapical pathology in retained teeth adjacent to the implant being placed. Adjacent lucencies have previously been found to increase implant failure. Endodontic treatment of teeth adjacent to implant sites, especially if those implant sites have teeth with lucencies, should be seriously considered.

The vast majority of implants had an insertion torque value at or above 15 N-cm. Only 72 implants had an insertion value between 5 and 14 N-cm. The failure rate of these implants was not significantly higher than that in those with high insertion values, but the number of less stable implants may have been too low to show significance.

In this study the question of implant placement into fresh extraction sites affected by periapical pathology has been evaluated with several confounding variables. It seems that the immediate placement of implants into sockets affected by chronic periapical pathology can be considered a safe and viable treatment option.

References