Implant Therapy in Aggressive Periodontitis - A Deadly Rehabilitation

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Abstract
Dental implants have revolutionized dentistry by showing a high success rate as a restorative option. This revolution in the research and technology along with long term studies has made the dental implants and an implant supported prosthesis as the first line of treatment with high rate of success when applied for single tooth or multiple teeth replacement. However, in the field of high implant success and predictability, dental implants are considered to be challenging in a small but significant subset of patients with aggressive periodontitis experiencing biological implant failure. When these patient’s teeth are replaced by implant supported restoration they represents slight attachment loss and bone loss which is a significant risk factor for implant failure around implants supported prosthesis.

However, there are controversies in the treatment of these patients with the dental implant as various studies have shown only short-term benefits with the use of dental implants in them.

Keywords: Aggressive periodontitis, Risk factor, Biological Implant failures, Peri-implantitis, maintenance program.

Introduction
In the era of modern dentistry, development of an ideal substitute for missing teeth has been one of the enduring aims of dentistry. The lasting benefits that dental implants give are functional resolution (improved mastication, comfort, speech) and esthetic resolution. Not only this, they have also replaced conventional treatment protocols which require huge cutting of the sound tooth structure. The success of dental implants depends on long term implant stability and initial osseointegration i.e. the absence of clinical mobility. However, sometimes implant fails probably due to multifactorial process. Reported predictors for implant success and failure are generally divided into patient-related factors (e.g., general patient health status, smoking habits, quantity and quality of bone, oral hygiene maintenance, etc.), implant characteristics (e.g., dimensions, coating, loading, etc.), implant location, and clinician experience. It is essential to identify a failing implant in time to avoid continuous alveolar bone loss which might complicate the option of replacing the failed implant with a new one as well as impair the aesthetic outcome of the area. This situation arises in compromised host i.e. patient with a history of aggressive periodontitis.
Periodontitis is an inflammatory disease of the tooth supporting structure which may result in tissue destruction. The more severe type is the generalized aggressive periodontitis which is the disease of healthy individuals generally in younger age group with rapid destruction of the alveolar bone around more than one tooth of the permanent dentition. Despite there being a presence of deep pockets and advanced bone loss these individuals lack clinical inflammation.

The deadly infection is restricted to permanent dentition and is affected by many risk factors like and the most common factor is the role of microbes and the immunological response of host towards microbes. The dominant microorganisms which adhere to and grow on the tooth’s surfaces are A. actinomycetemcomitans and P. gingivalis. Tonetti & Mombelli in 1999 stated that leukotoxin, endotoxins, collagenase, and chemotactic inhibition factor contribute to the disease process by destroying PMN’s & Macrophages along with degradation of collagen and inhibition of IgG and IgM. Not only microbes and host response but also the genetic make-up is involved in the pathogenesis of the progression of the disease leading to severe bone loss, attachment loss and finally the tooth is lost.

The criteria of success in implant dentistry remains complex. However the word success has been interchanged with the survival of implant. Therefore it is important to differentiate between the survival and the success. Implant success means that implants are not only in the mouth but are functioning and in acceptable condition whereas if the nonfunctional implants require additional treatment they are counted in the survival group.

James RA in 1980 presented the scale for clinical evaluation of implant quality which was later on modified by Misch in 1993 to evaluate the prognosis of an implant. Implant Therapy in Aggressive Periodontitis: For healthy patient, success rates of some implant systems have been reported to be 99%, even after 15 years follow –up. Therefore a lot of enthusiasm was generated. Over the last three decades, lots of researches were carried out for implant placement and its success by replacing the loss and maintaining the smile in the patients with a history of periodontal disease. Some of them have shown positive results whereas few studies have concluded with additional crestal bone loss after implants were placed in them. Furthermore, the long term prognosis of the teeth may be questionable because of tendency towards relapse of disease.

Mombelli A reported the presence of periodontal pathogens Actinobacillus actinomycetemcomitans, Porphyromonas gingivalis and Prevotella intermedia even after implants were placed at 3 months and 6 months. These pathogens from the periodontal pocket may transmit and colonies in the subgingival area of the implant site resulting in bacterial contamination and a condition known as peri-implantitis. This impression proves that the microorganisms responsible for aggressive periodontitis are similar with that of the peri-implant infection and failing implants. The identification of these patients is essential because prevention is better than cure as the health status of the peri-implant tissues is influenced by health of periodontal tissues.

In 2001, the criteria for success rate of implants with regard to patients with previous history of periodontitis were formulated as absolute immobility of the implant abutment, absence of periimplant osteolytic zones through radiograph and absence of inflammation and pain or parenthesis. This made a lot of curiosity among the clinicians and because of them various studies were carried out to analyze the success rate as well as the survival of implants along with detailed description of each parameter i.e. periodontal pocket probing depth, bleeding on probing, marginal bone loss, prevalence of peri-implantitis and implant survival.

Periodontal Pocket Probing Depth: Two studies reported deeper pockets around implants than teeth after an observation period of 5 years. A significant difference was reported especially in case of pockets with a depth of 4 mm, with an incidence of 16.9% and 26.6% around teeth and implants, respectively. Although patients undergoing a preventive maintenance program showed better results in terms of periodontal pocket depth, however, the PPD around implants was also deeper under such maintenance. One long term study (10 years observation period) showed no significant difference between both teeth and implants, with a PPD of 2.02
and 2.78mm respectively. In contrast, another study with the same observation period reported deeper PDD around implants than around teeth (Mengel et al 2007). In the study by Roccuzzo et al, the periodontal pocket depth was compared between three groups after 10 years observation period. Here, the mean PD was 3.1 ±0.5 in periodontally healthy individuals (PHP), 3.5 ± 0.9 in moderately periodontally compromised patients (PCP) and 3.9 ± 0.7 in severely periodontally-compromised patients. Here, the difference was considered significant between the PHP and severely PCP patients.

**Bleeding on Probing (BOP):** Most of the studies showed bleeding on probing with different percentages. In three studies, implants showed more susceptibility to bleeding on probing after 5 and 10 years, even if periodontal maintenance programs were followed. Other studies compared peri-implant bleeding on probing in periodontally-compromised subjects with periodontally healthy subjects and reported higher percentages in patients susceptible to periodontitis with a range between 32-40%.

**Marginal Bone Loss:** The marginal bone loss was measured as the distance from the marginal bone level to the shoulder of the implant. It was observed in most of the studies. Karoussis et al showed higher mean bone loss after observation periods of 10 years between periodontally healthy and periodontally-compromised subjects whereas Mengel et al showed a mean marginal bone loss of 1.3mm after 10 years in patients with generalized aggressive periodontitis. Also, after 10 years of observation period, significantly higher amount of bone loss in periodontally-compromised patients were reported as compared to periodontally healthy patients independent of the implant type used. In contrast, the study by Roccuzzo et al reported no significant difference between three groups (PHP, moderately and severely PCP). But Giansserra et al in 2010 reported the difference was significant in severe periodontitis (2.6mm) compared to non-periodontitis (1.2mm).

**The Prevalence of Peri-Implantitis:** An inflammatory process caused by anaerobic bacteria affecting the tissues around an implant and loss of supporting bone is known to be peri-implantitis. Leonhardt et al in 1993 stated that a regular maintenance program is essential in the periodontally compromised patients to keep the periodontal and peri-implant tissues healthy. A correlation between periodontitis and prevalence of periimplantitis was reported i.e. the incidence of periimplantitis was also significantly 14 times higher in patients with generalized aggressive periodontitis than periodontally healthy patients. These results were in accordance with the study of Karoussis et al which reported 28.6% of peri-implantitis in chronic periodontitis compared to 5.8% in the non-periodontitis group. Also Roccuzzo M et al observed the significant difference in the incidence of peri-implantitis between periodontally healthy (10.7%) and severely periodontally compromised patients (47.2%).

**Implant Survival:** Survival rate is defined as preservation of osseointegrated implant and not need to be removed at time of observation. One long term study (more than 10 years) reported a survival rate of 97.5% in periodontally-susceptible patients. An almost similar high survival rate of implants was reported in another study after an observation period of 5 years. In contrast to that, Mengel et al 2007 reported a lower survival rate of 83.3% in comparison to 100% in the periodontally healthy patients. This was further confirmed by two more studies reporting that implant in generalized aggressive periodontitis had a five time greater risk of failure than periodontally healthy individuals. However, Karoussis IK et al continued the follow up period to 10 years and reported a statistically significant difference with a survival rate of 96.5% and 90.5% for the healthy patients and patient with history of chronic periodontitis, respectively which was in accordance with the survival rate in study by Matarasso et al i.e. a survival rate between 85%-95% in periodontally compromised individuals in dependent of the type of implant used. However in the same study there was a trend towards increased loss of implant in periodontally compromised compared to periodontally healthy subjects.

Roccuzzo et al also found a high incidence of implant loss in both moderate PCP and severe PCP who did not adhere to the Supportive periodontal therapy program.
Effect of Smoking: Habit of smoking directly influences the survival of the implant as in periodontally compromised patients there are chances of increased risk of implant failure. In smokers the incidence of peri-implantitis has an odd ratio of 3.6 to 4.6. A study has shown that the marginal bone loss in smokers was approximately 1mm greater compared to non-smokers, and 0.76mm in smokers and 0.22mm in non-smokers, whereas the latest study done by Swierko et al described that smoking seems to have no serious influence on peri-implant condition in periodontally treated subjects with implants.

Thus, implant treatment in patients with aggressive periodontitis is not contraindicated, provided that adequate infection control and an individualized maintenance program are assured. Long-term studies on the success of periodontal therapy demonstrate that a well planned and executed periodontal treatment plan is effective in controlling disease progression and preserving the dentition as well as the peri-implant tissue. An evidence-based approach has been laid down for clinician to identify peri-implant tissue destruction by a protocol known as cumulative interceptive supportive therapy (CIST) which is based on the mucosal condition and the probing depth along the implant sites. It is take-out step by step, starting with mechanical debridement for removal of plaque and calculus at bleeding sites and probing depth less than 4mm. If the probing depth is between 4mm to 5 mm antiseptic therapy is also followed along with the mechanical debridement. In the presence of deep pockets with probing depth of more than 6mm, suppuration and signs of bone loss radiographically; antibiotic therapy is implemented along with the mechanical and antiseptic therapy. This result in control of peri-implant infection although this treatment is not sufficient if there is bone loss. So, depending on the extent and severity of the local bone loss, either regenerative or resective measures are to be carried out.

In general the instructions for maintenance of peri-implant site are similar to those for patients with natural dentition except that we should avoid the use of metal hand instruments and ultrasonic tips for calculus removal and also avoid acidic fluoride and abrasive prophylactic pastes.

Table 1: Evaluation of Implant Success

<table>
<thead>
<tr>
<th>Group</th>
<th>Clinical Conditions</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>I (optimum health)</td>
<td>• No pain or T.O.P&lt;br&gt;• No mobility&lt;br&gt;• &lt;1.5 mm crestal bone loss&lt;br&gt;• &lt;1mm bone loss in 3 years&lt;br&gt;• No history of exudate&lt;br&gt;• No radiolucency&lt;br&gt;• 0-1 bleeding index&lt;br&gt;• After 1 year, stable probing depth &lt;4mm</td>
<td>• Normal maintenance</td>
</tr>
<tr>
<td>II (satisfactory health)</td>
<td>• No pain or T.O.P&lt;br&gt;• No mobility&lt;br&gt;• 1.5 to 3 mm crestal bone loss&lt;br&gt;• &lt;1mm bone loss in 3 years&lt;br&gt;• Transient history of exudate&lt;br&gt;• No radiolucency&lt;br&gt;• 0-1 bleeding index&lt;br&gt;• &gt;4mm probing depth, but stable in last 3 year period</td>
<td>• Reduce stress&lt;br&gt;• Shorter intervals between hygiene appointments&lt;br&gt;• Gingivoplasty&lt;br&gt;• Yearly radiographs</td>
</tr>
<tr>
<td>III (compromised health)</td>
<td>• No pain or T.O.P&lt;br&gt;• 0-0.5 mm horizontal mobility after prosthesis delivery, no vertical mobility&lt;br&gt;• &gt;3 mm bone loss in the first year&lt;br&gt;• &gt;1mm crestal bone loss in 3 years</td>
<td>• Reduce stresses&lt;br&gt;• Drug therapy, Abs, chlorhexidine&lt;br&gt;• Surgical re-entry&lt;br&gt;• Change in prosthesis and / or implants</td>
</tr>
</tbody>
</table>
• history of exudate in last 3 years
• slight radiolucency around crestal portion of implant
• 1-3 bleeding index
• >5mm probing depth, increase in 3 year period

IV (clinical failure of the following conditions)
• pain on palpation, or percussion
• >0.5mm horizontal mobility after prosthesis delivery
• Uncontrolled progressive bone loss
• >half bone loss supporting implant
• Uncontrolled exudate
• Generalized radiolucency
• “Sleepers” (implants surgically placed but unable to restored).
• Removal of implant

V (absolute failure)
• Implant surgically removed
• Implants exfoliated
• Bone grafts

Table 2: Implant Therapy In Aggressive Periodontitis

<table>
<thead>
<tr>
<th>References</th>
<th>Type of study with follow up period</th>
<th>Study population and implants placed</th>
<th>Confounding factors</th>
<th>Parameters evolved</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baelum &amp; Ellgard (2004)</td>
<td>Retrospective study with 10 years follow up</td>
<td>108 PCP (201 implants)</td>
<td>Smokers 64%</td>
<td>B.O.P = 70% PD&lt;4mm =24% PD&gt;6mm= 25% BL&lt;1.5mm= 60% BL&gt;3.5mm=14%</td>
<td>Survival rate = 78%.smoking and peri-implantitis significantly associated with increased implant failure rate.</td>
</tr>
<tr>
<td>Karoussis et al (2004)</td>
<td>Prospective study with 10 year follow up period</td>
<td>89 patients with periodontal disease (179 implants)</td>
<td>ND</td>
<td>mPI mGI mBOP PD CAL</td>
<td>mPI = 0.40% for teeth ; 0.36 %for implants mGI = 0.28% for teeth; mBI = 0.19% mBOP= 30.2% for teeth ;42.2% for implantsPD= 2.02 mm for teeth; 2.78mm for implantsCAL= -2.69mm for teeth; -3.33mm for implants</td>
</tr>
<tr>
<td>Rosenberg et al (2004)</td>
<td>Retrospective study with 156 months follow up</td>
<td>151 PCP (519 implants )</td>
<td>Non-smokers</td>
<td>Implant characteristics Bone loss Attachment level</td>
<td>No data reported</td>
</tr>
<tr>
<td>Jansson et al (2005)</td>
<td>Retrospective study with 10 years follow up</td>
<td>766 patients treated for PDD (1796 implants)</td>
<td>Non-smoker</td>
<td>Survival rate</td>
<td>97% for maxilla 92% for mandible</td>
</tr>
<tr>
<td>Mengel &amp; Flores-de-Jacoby (2005)</td>
<td>Prospective longitudinal study with 3 year follow up</td>
<td>GAgP = 15 patients (77 implants) CP = 12 patients (43 implants) PH = 12 patients (30 implants)</td>
<td>Non-smoker with no systemic disease</td>
<td>Bone loss Peri-implantitis Survival rate</td>
<td>BL= 1.14mm; 0.86mm;0.7mm Peri-implantitis = NR Survival rate = 97.4%; 100%; 100%</td>
</tr>
<tr>
<td>Mengel et al (2005)</td>
<td>Prospective study for 3 year follow up</td>
<td>HP = 10 patients (11 implants) GAgp = 10 patients (15 implants)</td>
<td>Non-smoker with no systemic disease</td>
<td>Mean bone loss Peri-implantitis Survival rate</td>
<td>Mean bone loss for HP = 1.4mm For GAgP= 1.78mm Peri-implantitis = NR for both groups Survival rate = 100% for HP and 97.4% for GAgP</td>
</tr>
<tr>
<td>Roos-Jansaker et al</td>
<td>Prospective study</td>
<td>218 patient (1057)</td>
<td>BOP,</td>
<td></td>
<td>B.O.P at implant site = 46.6± 27%</td>
</tr>
</tbody>
</table>
Dr. Lolakshi Kachroo, et al. International Journal of Dental Science and Innovative Research (IJDSIR)

Table: Prevalence and Survival Rates of Peri-implantitis

<table>
<thead>
<tr>
<th>Study (Year)</th>
<th>Study Design</th>
<th>Follow-Up</th>
<th>Patient Groups</th>
<th>Implants</th>
<th>Survival Rate</th>
<th>Prevalence of Peri-implantitis</th>
</tr>
</thead>
<tbody>
<tr>
<td>(2006)</td>
<td>Prospective cohort study with 10 year follow up</td>
<td>9-14 years</td>
<td>5 GAgP patients = 36 implants, 5 PH patients = 7 implants</td>
<td>No systemic disease, Non-smokers</td>
<td>Bone loss, Peri-implantitis, Survival rate</td>
<td>Bone loss recorded as 3.37mm for GAgP, and 1.24mm in PH patients. Peri-implantitis was not reported. Survival rate is 83.3% for GAgP and 100% for PH.</td>
</tr>
<tr>
<td>(2007)</td>
<td>Prospective cohort study with 10 year follow up</td>
<td>9-14 years</td>
<td>16 GAgP patients = 59 implants, 68 CP patients = 193 implants, 110 PH patients = 261 implants</td>
<td>GAgP patients were also involved in smoking = 4% and systemic disease = 9%</td>
<td>Bone loss, Peri-implantitis, Survival rate</td>
<td>Bone loss in GAgP, CP and PH are 0.17mm, 0.09mm and 0.07mm. Peri-implantitis was 12.7%. Survival rate was 84.8%; 96% and 97%.</td>
</tr>
<tr>
<td>(2007)</td>
<td>Retrospective study for 10 year follow up</td>
<td>9-14 years</td>
<td>40 patients PCP and 40 PHP (80 implants)</td>
<td>Non-smokers</td>
<td>FMPS, FMBS, MEAN BONE LOSS, IMPLANTS WITH BONE LOSS &gt;3MM</td>
<td>High marginal bone loss rate around implants placed in PCP as compared with PHP. The survival rate are PCP=92.5% PHP=95%</td>
</tr>
<tr>
<td>(2007)</td>
<td>Prospective cohort study with 10 year follow up</td>
<td>9-14 years</td>
<td>PHP (28), moderately PCP (37) and severely PCP (36), with 246 implants placed</td>
<td>Mean plaque score</td>
<td>Mean plaque score</td>
<td>Patients with history of periodontitis presented a lower survival rate and higher number of sites with peri-implant bone loss. The survival rates are PHP=96.6% Moderate PCP=92.8% Severe PCP=90%</td>
</tr>
<tr>
<td>(2007)</td>
<td>Retrospective study for 10 years</td>
<td>9-14 years</td>
<td>PHP = 20, PCP = 20 (40 implants)</td>
<td>Smokers consuming &gt;10 cigarette/day at the beginning and at the 10 year follow up</td>
<td>FMBS, BL</td>
<td>Implants placed in patients with the history of smoking and history of treated periodontitis yield lower survival rate and higher marginal bone loss.</td>
</tr>
<tr>
<td>(2007)</td>
<td>Retrospective study for 7.9 year follow up</td>
<td>9-14 years</td>
<td>172 patients (161 implants)</td>
<td>smoker</td>
<td>PD, CAL, BOP, FMBS</td>
<td>Significant risk for development of peri-implantitis and implant loss. The survival rate is 95.8%</td>
</tr>
<tr>
<td>(2007)</td>
<td>Retrospective study for 8 year follow up</td>
<td>9-14 years</td>
<td>PCP = 30 patients (56 implants), PHP = 30 patients (61 implants)</td>
<td>Peri-implantitis, PD around implants, BOP, BONE LOSS, FMPS, FMBS</td>
<td>PD&gt;6mm have high risk for peri-implantitis. The prevalence for it was 26.1%</td>
<td></td>
</tr>
<tr>
<td>Study Authors and Year</td>
<td>Study Design</td>
<td>Patient Groups and Follow-up</td>
<td>Mean plaque score</td>
<td>Bone loss</td>
<td>Survival Rate</td>
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<tr>
<td>Rocuzzo et al (2012)</td>
<td>Prospective cohort study with 10 year follow up</td>
<td>PHP (28), moderately PCP (37) and severely PCP (36) (246 implants)</td>
<td>FMPS</td>
<td>BOP</td>
<td>FMBS</td>
<td>PD</td>
</tr>
<tr>
<td>Swierkot et al (2012)</td>
<td>Prospective cohort study with 5-16 year follow up</td>
<td>35 patients of GAgp (149 implants) 18 patients of PH (30 implants) GAgp patients: Non smoker = 58, Former = 28, Current = 63 PH patients: Non smoker = 19, Former = 5, Current = 6</td>
<td>FMBS</td>
<td>PD</td>
<td>BL</td>
<td>FMPS</td>
</tr>
<tr>
<td>Rocuzzo et al (2013)</td>
<td>Prospective cohort study with 10 year follow up</td>
<td>PHP = 32; moderately PCP = 46 and severe = 45. (252 implants)</td>
<td>Plaque score</td>
<td>FMBS</td>
<td>PD</td>
<td>BL</td>
</tr>
</tbody>
</table>

**Abbreviations:** PCP = Periodontally compromised patients, PHP = Periodontally healthy patients, B.O.P = Bleeding on probing, PD = Probing depth, BL= Bone loss, mPI = Mean plaque index, mGI = Mean gingival index, mBL= Mean bone loss, mBOP = mean bleeding on probing, CAL = Clinical attachment loss, GAgP = generalized aggressive periodontitis, CP = chronic periodontitis, FMPS = Full mouth plaque score, FMBS = Full mouth bleeding score, ND = No data.

**Conclusion**
The treatments which can be conducted in a standard dental care practice have made implant therapy an integral part of the modern dentistry. This revolution in the field of dentistry has hold future development of the society. But the periodontal disease is a potential risk factor for causing peri-implantitis which may results in failure of implant therapy. However dearth of scientific evidence based literature does not allow for drawing clear conclusions for placing implants in periodontally compromised host.

Therefore it seems prudent to screen all the individuals for periodontal disease before making any decision for implant placement.

**References**


36. Roccuzzo M, Bonino L, Dalmasso P and Aglieta M. Long term results of a three-arm prospective cohort study on implants in periodontally compromised