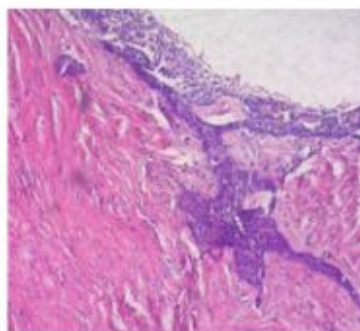
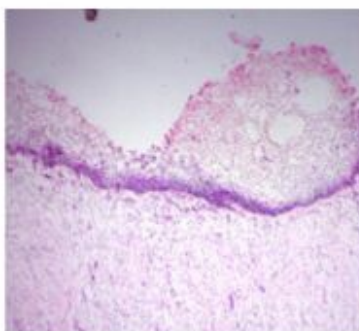
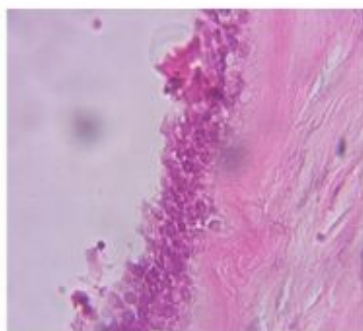


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Evaluation of Periodontal Parameters around Osseointegrated Dental Implants in Benin City, Nigeria

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ABSTRACT

Objective: Peri-implant diseases which include mucositis and peri-implantitis may occur when implants are placed. A proper assessment of the periodontal parameters of dental implants and a good understanding of the hard and soft tissues surrounding dental implants are paramount to enhance long term success rates. The objective of this study was to evaluate the periodontal parameters around osseointegrated Dental implants in Benin City, Nigeria.

Methods: Clinical and radiologic evaluation of all patients who had osseointegrated dental implants placed either in the anterior or posterior region were done over time (2012-2014). The periodontal parameters include marginal bone level, probing depth, suppuration, radiographic bone loss and implant mobility. Statistical significance between frequencies, gender differences was evaluated with the chi-square test. Significant values of $P < 0.05$ were applied.

Results: A total number of 47 implants were placed with a success rate of 93.6% over a 3-year period and a failure rate of 6.4%. Anterior implants were placed in 21 (44.7%) and posterior in 26 (55.3%). Bone level for anterior implants recorded an average marginal bone loss of less than 0.5mm and an insignificant level for the posterior region. Probing depth at 3 months post op showed an average minimal depth of 0.5mm. Suppuration was seen in 6.4% and radiographic bone loss visible in 12.8% at 3 months. There was however no significant difference in pre and post-op values bleeding on probing and radiographic bone loss. Implant mobility was observed in 25.5% at 3 months post-op, 6.4% at 6 months and reduced to 0% at 3 years.

Conclusion: Periodontal outcomes of the studied osseointegrated dental implants were favourable, indicating better stability and a high success rate over a period of 3 years.

Keywords: Dental implants, periodontal parameters, success

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INTRODUCTION

Dental implants are a newer method of dental replacement and clinical and radiographic evaluation over time is important to assess clinical outcomes.¹⁻³ The periodontal tissues are an important factor in osseointegration and in anchoring the implant to the bone and supporting soft tissues.^{4,5} The health of the periodontal tissues is usually assessed in normal tissues and periodontal probing is a basic diagnostic tool for determination of the periodontal condition of a tooth.² However, where teeth have been lost as a result of trauma or caries, replacement is indicated and dental implants are recommended.^{1,3,6} The soft tissue surrounding implants is known as the peri-implant mucosa and it is histologically different from the gingival mucosa.¹ Peri-implant evaluation is important to monitor the success of the implant and its long term survival. These include bleeding on probing,

suppuration, probing depth, radiographic bone loss and implant mobility.^{4,5}

Diseased tissues around normal teeth result in gingivitis and periodontitis when it extends to the alveolar bone. When compared with similar changes around implants, peri-implant mucositis and peri-implantitis are used to denote diseased soft tissues and also extending to the bone respectively.^{1,7-10} Peri-implant mucositis is defined as a reversible inflammatory process in the soft tissues surrounding a functional implant. Peri-implantitis on the other hand is an inflammatory process characterized by peri-implant bone loss.¹¹ Studies have shown that the clinical probing depth is decreased around implants when compared to natural teeth.⁴ This is because the peri-implant sulcus is surgically created while that of natural teeth develops as the tooth erupts.^{4,5} Bleeding on probing is a sign of inflammation around normal teeth but it is not a usual or reliable finding around implants.^{1,2}

Other periodontal parameters for implant stability and long term success include the marginal bone level over time around the implants and the presence or absence of suppuration.^{1-3,6-8} While most studies in our environment determined the prevalence of implants, there appear to be no

studies evaluating the relationship between periodontal parameters and long term stability of dental implants. The objective of this study was to evaluate the periodontal parameters over time in osseointegrated dental implants in Benin City, Nigeria.

MATERIALS AND METHODS

Forty seven dental implants were placed in 20 patients who met the selection criteria of adequate bone volume on radiographic evaluation. The patients, who had no history of smoking or drug abuse, no history of diabetes mellitus, serious systemic disease or bleeding disorders, were included in this prospective clinical study and evaluated pre and post-operatively for the following: bleeding on probing, suppuration, probing depth, radiographic bone loss and implant mobility. Implants were evaluated at 6months, 1 year, 2 years and 3 years.

Bleeding on Probing

This was determined by probing the mesial and distal aspects of the implant. A metal probe was inserted gently into the sulcus with gentle pressure and graded as follows:

Negative – no bleeding

Positive – presence of bleeding

Suppuration

This is described as the discharge of pus from around the neck of the implant and graded as follows:

Negative – no suppuration

Positive – presence of suppuration

Probing depth

This was done with a ball ended periodontal probe around the mesial and distal aspects of the implant and measurement taken in millimeters

Radiographic bone loss

Pre and post-operative evaluation of the marginal bone was assessed for vertical bone loss. The crestal bone was measured to the deepest area of radiolucency on both the mesial and distal aspects of the implant with the aid of a ruler on the orthopantomogram and compared 3, 6, 12, 24 and 36 months later.

Implant mobility

This was evaluated using Mish's Clinical Implant Mobility scale⁶ after the use of two rigid instruments to apply a labio lingual force on the implant at 3 months and just before loading of the implant. Mobility was determined as follows:

Scale	Decription ⁶
0	absence of clinical mobility with 500g in any direction
1	slight detectable horizontal movement
2	moderate visible horizontal mobility up to 0.5mm
3	severe visible horizontal mobility greater than 0.5mm
4	visible moderate to severe horizontal and any visible vertical movement

Statistical analysis was performed using the Statistical Package for Social Sciences (SPSS, Windows version 11). Statistical tests of significance between frequencies and gender differences were evaluated using the chi-square test. The confidence level was set at 95% and probability values ($P < 0.05$) were regarded as significant.

RESULTS

There were a total of 20 patients made up of 11 male and 9 female subjects in this study. A total number of 47 implants were placed with a success rate of 93.6% over a 3-year period and a failure rate of 6.4%. The age range was 19-79-years with a mean age of 45.2 years. Figure 1 demonstrates the placement of a dental implant intraorally. Table 1 shows a total number of 31(66%) implants placed in the upper jaw and 16 (34%) in the lower jaw. More of the implants (29.8%) were placed to replace the upper central incisor followed by the lower first molar with 12.8%. Figure 2 demonstrates the prevalence of implant placement.

Bleeding on probing was negative in majority of implants, 95.7% and positive in 4.3%. Suppuration was positive in 6.4% and negative in 93.6%. Probing depth was not significant for both anterior and posterior implants $P > 0.05$ with a mean average of 0.5mm in anterior implants and 0mm for posterior implants respectively. Figure 3 shows a demonstration of radiographic bone loss measurement on the Orthopantomogram (OPG). No significant bone loss is seen for all implants at 3, 6, 12, 24 and 36 months respectively, ($P > 0.05$). The average bone loss for anterior implants was > 0.5 mm across time and ± 0 mm for posterior implants (Table 2). A percentage assessment of both clinical and radiographic parameters to include bleeding on probing, suppuration, probing depth, radiographic bone loss and implant mobility is demonstrated in Figure 4. Implant mobility was highest at 3 months in 25.5% but reduced to 0% at 36 months. Bleeding on probing was the lowest periodontal issue demonstrated and was seen in 4.3%.

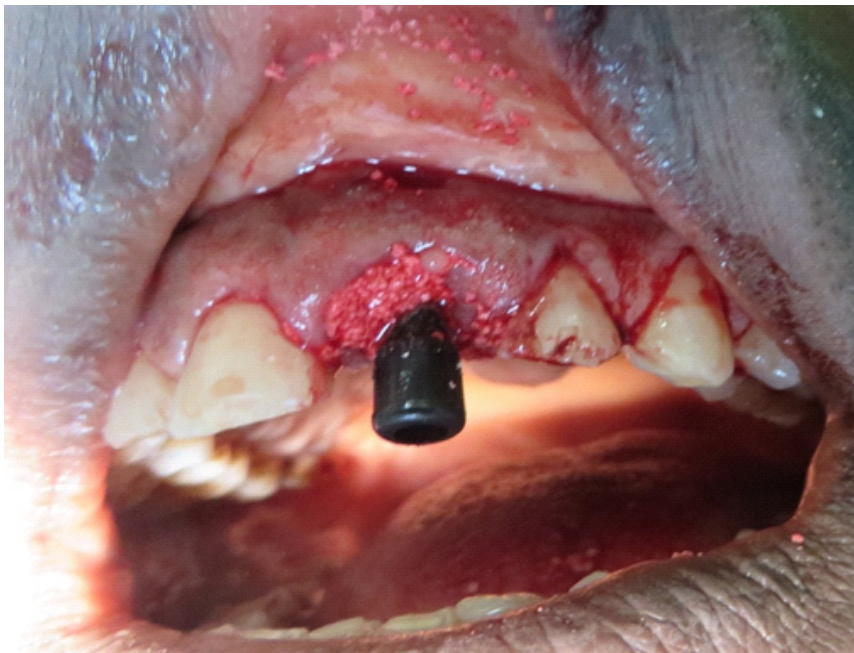


Figure 1: Intra oral view of a dental implant replacing a missing maxillary right central incisor

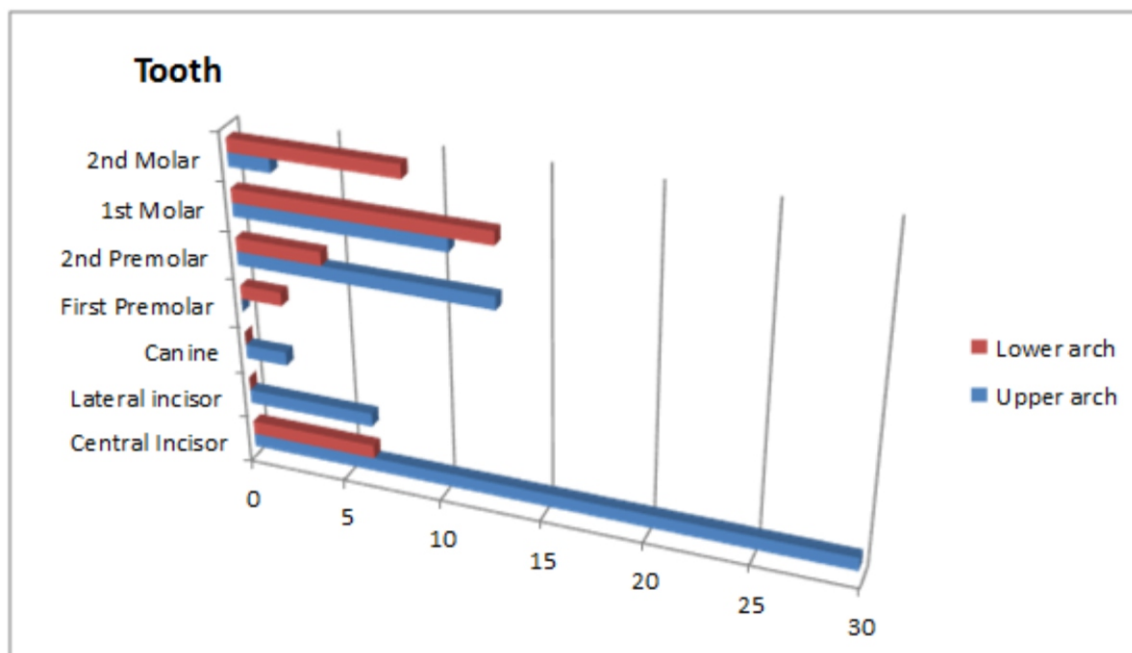


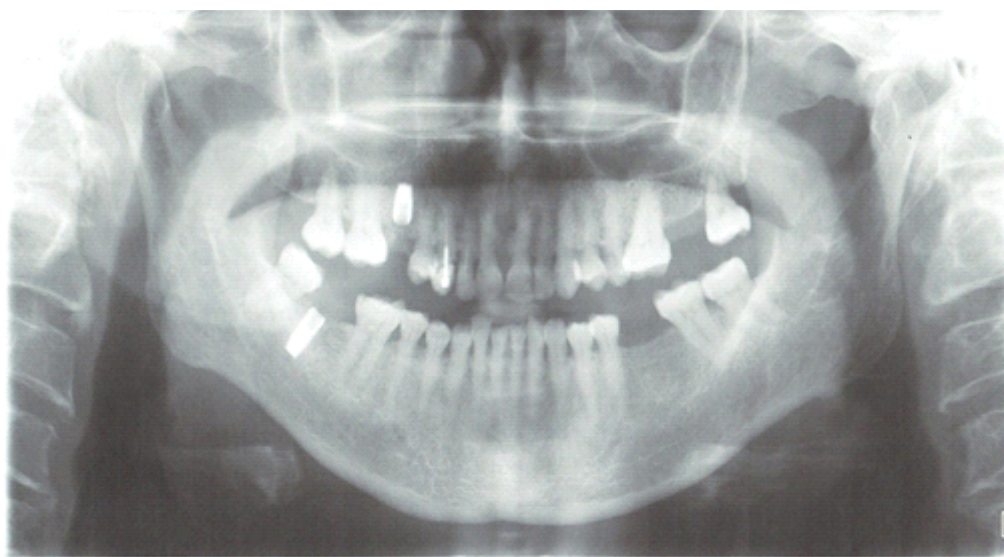
Figure 2: Prevalence of implant placement in the upper and lower arch

Table 1: Distribution of implants in the mouth of patients

Tooth	Upper Quadrant		Total n(%)	Lower Quadrant		Total n(%)
	Right n(%)	Left n(%)		Right n(%)	Left n(%)	
Central Incisor	8(17)	6(12.8)	14(29.8)	1(2.1)	2(4.3)	3(6.4)
Lateral Incisor	1(2.1)	2(4.3)	3(6.4)	-	-	-
Canine	1(2.1)	-	1(2.1)	-	-	-
1 st P/molar	-	1(2.1)	1(2.1)	-	1(2.1)	1(2.1)
2 nd P/molar	4(8.5)	2(4.3)	6(12.8)	1(2.1)	1(2.1)	2(4.3)
1 st Molar	2(4.3)	3(6.4)	5(10.6)	1(2.1)	5(10.6)	6(12.8)
2 nd Molar	1(2.1)	-	1(2.1)	2(4.3)	2(4.3)	4(8.5)
Total	17(36.2)	14(29.8)	31(66.0)	5(10.6)	11(23.4)	16(34.0)

Table 2: Comparative evaluation of the mean differences of bone loss of implants over time

Time (Months)	Anterior Implant position		Posterior Implant position		P-value
	Mesial Mean Difference	Distal Mean Difference	Mesial Mean Difference	Distal Mean Difference	
3	1.5±2.75	0.0±	0.0±	0.0±	P=0.820
6	1.0±3.15	0.0±	0.0±	0.0±	P=2.45
12	0.0±	0.0±	0.0±	0.0±	NS
24	0.0±	0.0±	0.0±	0.0±	NS
36	0.0±	0.0±	0.0±	0.0±	NS
P>0.05					

**Figure 3: Diagrammatic representation of radiographic evaluation of crestal bone height in relation to depth of implant**

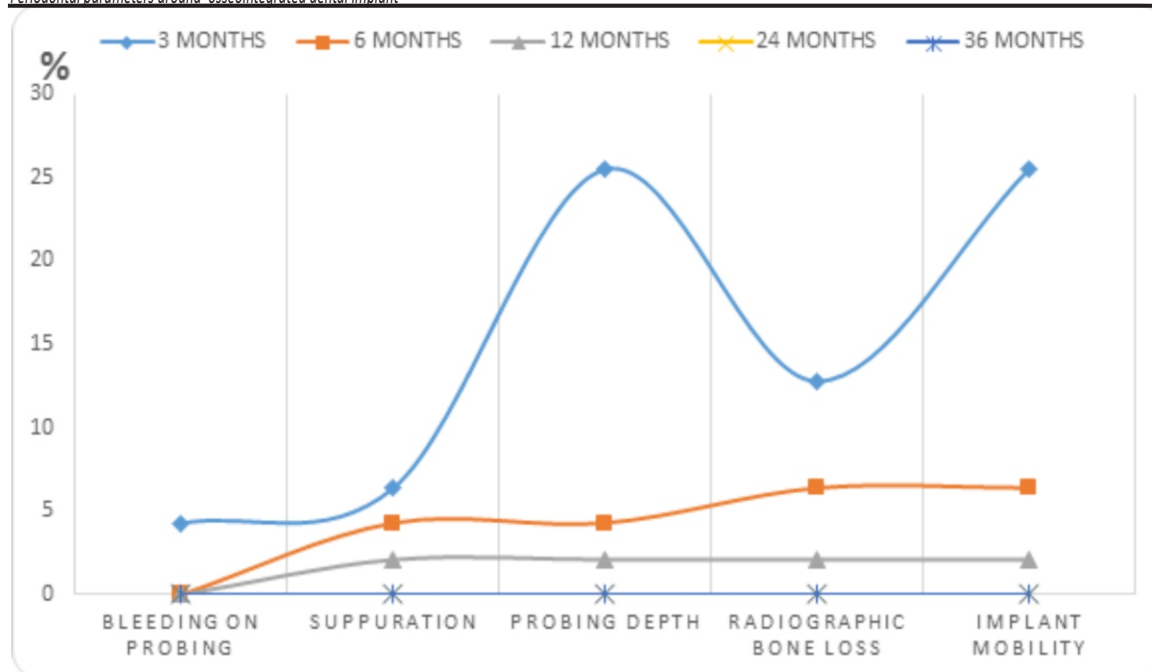


Figure 4: Percentage assessment of periodontal parameters of Implants over a three year period

DISCUSSION

This study evaluated periodontal parameters around osseointegrated dental implants over a three year period.

Numerous studies have been carried out to assess the clinical outcomes in implants and these include parameters such as bleeding on probing, suppuration, probing depth, radiographic bone loss and implant mobility over time.^{1-4,9} While this present study evaluated all these parameters, the success rate of 93.6% in this study is in agreement with other studies^{2,9-12} where these parameters were negative or reduced.

Bleeding on probing in this study was identified in the lowest number of participants (4.3%) and seen only at 3 months post-op. A larger number of implants in this study recorded a negative value for bleeding on probing which indicates a greater success rate. Studies by Dhir et al.¹ showed that bleeding on probing is a clinical indication of peri-implant disease. Their study¹ demonstrated that bleeding on probing is a diagnostic index of progression from a healthy to a diseased state¹. This is also in conformity with results from other studies where bleeding on probing should be minimal for long term stability and retention.^{1,3,4,6,7,11.}

This current study recorded a high negative value in suppuration which is in conformity with other studies on long term success and stability of implants.⁸⁻¹¹

Probing depth in this present study was a mean value of 0.5mm for anterior implants and 0mm for posterior implants. This was not significant and is

in agreement with the results from other studies^{4,9,11} where no significant probing depth was determined. Studies by Lindhe et al.⁴ determined that the probing depth for implants is not as meaningful as in natural teeth and is not a significant factor in peri-Implant disease formation or stability of implants.⁴ Other studies⁹ in agreement with the findings from this present study where mesial and distal sites of the implant were probed with minimal force just before the placement of the abutment tooth showed a minimal probing depth of 0.25mm.⁹

This study did not find any significant difference in mesial and distal marginal bone loss around anterior and posterior implants over a thirty six month period. This is similar to studies by Bilhan et al.⁸ where bone loss was also not statistically significant. Another study⁷ determined that the marginal bone loss around implants studied over a 5 year period did not exceed 1mm. Schwartz et al.³ in their study on the long term success of implants suggested four patterns of marginal bone loss over time with bone loss ranging from low initially to almost no bone loss or a complete loss of bone support. Marginal bone loss is a significant factor in determining the success of implants and the lower the loss, the greater the long term stability and success.^{3,8,10-11}

Implant mobility in this present study was observed in 25.5% at 3 months post-op, 6.4% at 6 months and reduced to 0% at 3 years. Osseointegration can only take place if the implant is immobile and long term stability is an important prerequisite for long term success. This

is in agreement with other studies⁸⁻¹² where mobility reduces the long term success of implants. The immediate post-op period is critical in the process of osseointegration and long term studies have revealed success rates as high as 93.6% over a three year period as recorded in this present study. This is in agreement with high long term survival rates of implants as demonstrated in other studies.^{2-3,7,12-15}

CONCLUSION

In conclusion, the periodontal parameters around osseointegrated dental implants in this study were favourable with a high success rate over a three year period. Periodic evaluation of these periodontal parameters over time is important to prevent peri-implant disease and enhance a high survival rate over time.

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