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Implant Supported Dentures and its Complications: An Observational Study

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ABSTRACT

Aim: Evaluation of implant supported dentures and associated complications.

Materials and Methods: A retrospective study was carried out in the Department of Dentistry, Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar, India for 1 year. Predictor variables were grouped into demographic, medical history, implant-specific, anatomic, prosthetic, and reconstructive categories. Complications were grouped into inflammatory, prosthetic, operative, and major or minor categories. Cox proportional hazards regression models were developed to identify risk factors for complications.

Results: The sample was composed of 100 patients. Overall frequency of complications was 37%. The average age was 40.5 years. The majority of patients were healthy & classified ASA I or II. Tobacco use at the time of implant placement was reported by 14% of patients. Equal numbers of implants were placed in maxilla and mandible. Less than 22% of the implants were placed using a 1- stage procedure. 26% of the implant sites were associated with reconstructive procedures Based on the regression analysis, tobacco use (P =0.002), staging (P = 0.002), Site (P <0.0245), and the use of reconstructive procedures (P <0.0001) were associated with an increased risk for complications.

Conclusion: The findings of our study may be used to decrease the incidence of implant-associated complications and to better assist the patient in selecting the most appropriate treatment option.

Keywords: Implant, denture, complications.

INTRODUCTION

One of the main challenges faced by dentists has been replacing missing teeth to the satisfaction of their patients. Implant therapy is a basic and durable option for replacing missing teeth.[1–3] In addition to aesthetic and phonetic improvements, prostheses are required for chewing ability; otherwise, nutrient intake is severely restricted and can result in many health complications. Implant-supported dentures improve the biomechanical integration of the dentures by providing them with a better retention and also increase the biting force by partially relieving the gingivo-mucosal support of occlusal loads.[4] The maximum occlusal force of patients with dentures can improve by 300% with an implant-supported prosthesis.[1] It is clearly established that patient quality of life is increased after implant treatment. Many of the material and application methods developed do not completely prevent failed applications. As a result, early and late complications are unavoidable.[5,6]While contemporary implant dentistry provides the clinician with a wide variety of restorative options, understanding the possible long-term complications arising from such procedures is important.[2,7]

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In various clinical trials, the long-term prognosis and predictability of implant-supported prostheses is well documented.[8] However, researchers do not yet fully understand the etiology of implant complications. During the past 2 decades, one of the major interests in implant research has been the success and/or failure of implants from a biological point of view. More recently, implant research has focused on factors affecting prosthetic outcomes and patient satisfaction with treatment.[2,3,9]

MATERIAL AND METHODS

This study was carried out in the Department of Dentistry, at Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar, India for 1 year.

Methodology

Total of 100 patients who received Dental implants & prosthesis were included in this study. The Minimum follow up was done for 12 months. Patients were selected irrespective of sex, caste and socio-economic status. Patients aged between 18-67 years and patients with missing teeth indicated for Dental implants were include in this study. An active infection or a history of persistent infections and medically compromised patients were excluded from the study.

The date of the first implant complication was documented and then the complication was being categorized into 1 of 3 groups: inflammatory, operative, or prosthetic. We evaluated the Implant mobility, Pain, Infection, Gingival recession, impaired wound healing and Peri-implantitis in all the patients. Inflammatory Complications were further categorized as major or minor. A major complication was defined as a complication that resulted in implant failure. A minor complication was defined as a complication not associated with implant loss. Prosthetic Complications such as Abutment fracture or loosening, need for occlusal or prosthetic adjustment more than 2 weeks after definitive restoration and Need for recementation of loose fixed prosthesis within 2weeks of delivery were studied. Operative Complications such as inadvertent placement of an implant into the sinus or the submandibular space, Paraesthesia, defined as the patient's subjective complaint of numbness/ tingling lasting atleast 7days after implant surgery and Buccal wall fenestration were studied.

Data Analysis

Data Analysis Complication frequencies and descriptive statistics were computed with SPSS (statistical package for social sciences) Version 18.0 statistical analysis software. Descriptive statistics were computed for all study variables. Potential risk factors for complications were identified using the regression model. The level confidence interval and p-value were set at 95% and 5%.

RESULTS

Total of 100 patients who received Dental implants & prosthesis were included in this study. The Minimum follow up was done for 12 months. Because patients commonly had more than 1 implant placed, the issue of correlated observations arises. To produce statistically valid inferences for clinical interpretation, 1 randomly selected implant per patient was chosen for analysis and one type of complication was selected. The results that follow are based on 100 patients and 100 implants.

Overall frequency of complications was 37%. The average age was 40.5 years. The majority of patients were healthy & classified ASA I or II. Tobacco use at the time of implant placement was reported by 14% of patients. Equal numbers of implants were placed in maxilla and mandible. Less than 22% of the implants were placed using a 1- stage procedure. 26% of the implant sites were associated with reconstructive procedures Based on the **Bivariate analysis**, tobacco use (P =0.002), staging (P = 0.002), Site (P <0.0245), and the use of reconstructive procedures (P <0.0001) were associated with an increased risk for complications. The multivariate logistic regression analysis was constructed using these patients. For current tobacco use, the odds ratio was 8.7555 (P = .0.0481; 95% confidence interval[CI],1.0230 to 72.7446) suggesting that smokers were 8.6655 times more likely to have

implant complications than non- smokers. The odds ratio for implant staging was 3.7987(P = 0.0317; 95% CI, 0.5786 to 26.1872), with 1-stage implants having a 3.79 times increased risk for complications. The use of reconstructive procedures was also associated with an increased risk for complications (odds ratio 5.97; P = 0.019; 95% CI, 0.0000 to 0.0000). Placement of dental implants in maxilla has 3.6517 times more likely to have implant complication than mandible. (Odds ratio=3.6487; P=0.020,955CI, 0.4238to31.4108).

Table 1: Type of complication.

Parameter	N	%
Intraoperative	7	7
Prosthetic	3	3
Inflammatorty	27	27

Table 2: Overall complication rate.

	N	**%**
Overall complication rate	37	37
Major complications	20	20
Minor complications	17	17
Inflammatory complications	27	27
Peri-implantitis	11	11
Mobility	6	6
wound healing	7	7
Pain	2	2
Infectious process	1	1

Table 3. Multivariate Logistic regression Analyses of Potential Factors Associated with Implant Complications.

Variable	**Odds Ratio**	**95% CI**	**P value**
Age (18 to 45 Vs 45 & above)	0.6247	0.1337 to 3.0745	0.5578
Gender (female Vs male)	0.4875	0.0987 to 2.3352	0.3602
Implant staging (1- Vs 2-stage)	3.7987	0.5786 to 26.1872	0.0317
Reconstructive procedure (yes Vs no)	5.97	0.0000 to 0.0000	0.019
Tobacco use (smoker Vs non smoker)	8.7555	1.0230 to 72.7446	0.0481
Site (Mandible Vs Maxilla)	3.6517	0.4238to31.4108	0.020
Position (Posterior Vs Anterior)	0.2854	0.0485 to 1.6794	0.1655
Prosthetic type (removable Vs fixed)	0.2546	0.0076 to 8.4779	0.4444

DISCUSSION

To date, most clinical implant research has focused on descriptions and factors associated with implant success. Systematic reports of complications and associated risk factors are limited. A prospective study by Muftu A et al.[10] on 168 patients who received 432 Bicon implants to replace posterior dentition reported a 0.74% frequency of abutment loosening, a 0.5% frequency of abutment fracture, and a 3.71% frequency of crown replacement necessitated by cement failure or porcelain fracture. In this study, the frequency of prosthetic complication was 7%. Analyses of prosthetic and operative complications were limited because of the small number of patients who experienced these complications. Regardless, the multivariate Cox model showed that no variables were statistically associated with prosthetic complications. A retrospective cohort study by Nancy E. McDermott et al.[11]who received Bicon implants (Bicon, Boston, MA) between 1992 and 2000. The overall frequency of implant complications was 13.9% (10.2% inflammatory, 2.7% prosthetic, 1.0% operative).The present study showed, the overall frequency of implant complications occurring after placement of Dental implants was 37% (27%inflammatory, 7% operative, 3% prosthetic). In inflammatory complications maximum complications were peri-implantitis (11%), followed by impaired wound healing (7%), mobility(6%)and Pain(2%). Endosseous implants developing peri-implantitis (clinical suppuration or bone loss radiographically) that are still immobile should be attended too quickly to prevent their failure. Minimal bone loss and probing depths of less than 4 mm usually require plaque and calculus removal, polishing of the implant crown, and increased oral hygiene visits annually. Mild bone loss and probing depths of 4 to 6 mm require, in addition to increased hygiene visits, chlorhexidine rinses daily or the application of chlorhexidine gels to the affected area. Applying citric acid directly to the exposed implant threads can be considered to detoxify the area. Once any suppuration, oedema, and/or infection has resolved, it is reasonable to consider guided tissue regenerative procedures with allogenic bone grafting to restore bone height around the implant. If the implant is restored, the restoration should be taken out of occlusion to minimize functional loads. Mobility of implants results in implant failure, and removal is required with possible bone grafting if desired.[12]

In our study Impaired wound healing occurred in 7 patients (7%) which was in form of Soft tissue breakdown occurring within 21 days or more after implant surgery, exposing bone, graft material, or the implant. Incision line dehiscence usually occurs as a result of lack of a tension-free closure or sharp edges of the graft perforating the overlying soft tissue. Considerations prior to grafting include evaluating the soft tissue envelope of recipient area specifically considering the quality and amount of keratinized mucosa, tissue thickness, and presence of scar tissue. It is important to remember that bone grafting increases volume of underlying bone in the grafted site; evaluating the soft tissue prior to grafting is essential to ensure that the recipient site soft tissue can accommodate the bone graft in a tension-free fashion. Ideally, most incisions should be placed on the crest of the alveolar ridge, as this allows for maximal blood supply to the flap. Flaps placed too buccal, palatal, or lingual may have decreased vascular supply, risking necrosis of the flap. Another issue to consider is that by extending existing tissue to cover graft sites, there may be resulting obliteration of the associated vestibule; as such, patients should be made aware of need for a secondary vestibuloplasty as needed. Small pin- point dehiscence's can often be easily managed by local wound care (warm salt water rinses and good hygiene). Larger dehiscence may require non alcohol-based rinses (alcohol based rinses can be toxic to non vascularised bone grafts), local wound care, oral antibiotics to minimize infection risk, and/or debulking of the graft to allow for primary closure .Necrotic graft material should be debrided.[12]A retrospective cohort study design by Valerie V. Woo et al.[13]in which the main predictor variable was the use of DRPs, such as external or internal sinus lifts, onlay bone grafting, or guided-tissue regeneration with autogenous bone grafts or

autogenous bone graft substitutes, to enhance the recipient sites before implant insertion. In the multivariate model, patients with DRPs did not have a statistically significant increased risk for implant failure (odds ratio =1.4, P = 0.3). The present study showed that use of reconstructive procedure for Dental implant placement was statstically significant & associated with Implant complication. The multivariate statistics showed that implant complications were significantly related to reconstructive procedure (odds ratio5.97,P=0.019).In present study complication rate was 55% in maxilla and 20% in mandible. It might be due to the reason that cortical thickness and density of the mandibular bone are higher than those of the maxillary bone. A similar study was conducted by William martin et al.[14]where they showed that implant success rates are higher for mandibular implants, and failure rates are higher in the posterior regions of the jaws. Type 3 or 4 bone quality in the jaw bone is associated with high implant failure rates. In a10-year longitudinal study found that patients who smoked and had poor oral hygiene exhibited significantly (P<.001) more marginal bone loss than did patients who did not smoke.[15]The present study showed that out of 100 patients, 14 patients were smokers and complication was noted in 9 patients (odds ratio 8.7555; (P=.0481). This indicates that they have statistically significant increased risk for implant complications.

Smoking is a common contributor to decreased tissue oxygenation. Carbon monoxide, oxidating radicals, nitrosamines and nicotine are released during smoking. Nicotine causes a systemic increase in epinephrine, nor-epinephrine and carboxyhemoglobin and also decreases blood flow, collagen deposition, prostacyclin formation; it increases platelet aggregation, causes polymorphonuclear neutrophil dysfunction and increases fibrinogen, haemoglobin and blood viscosity all of which negatively affect wound healing. It has been concluded that long term smoking results in poor bone quality and a poorer prognosis for implants.[16]BaelumVetal.[17]have done studies which showed that the risk of implant failure is lower with the submerged technique (2- stage) than with the non-submerged technique**.** This is in accordance with our study where total of 100 dental implant placed, out of which 78 were stage 2 & 22 were stage 1. Complications are more in stage 1 as compared to stage 2. Multivariate Cox proportional hazards regression model shows (Odds ratio=3.7987 P=0.0317). It means that in comparison to 2-stage procedures, 1-stage procedures have 3.7987 times increased risk for implant complications. The reason for the higher success rate with the submerged implant technique could be because of the minimal risk of bacterial infection. In terms of overall complications, the multivariate Cox proportional hazards regression model indicated that smoking at the time of implant placement, use of reconstructive procedures,1-stage implants and dental implant placement in maxilla were statistically associated with an increased risk for overall implant complications. Inflammatory complications composed 27% of the complications, followed by operative and prosthetics complications, 7% and 3%, respectively. The frequency of inflammatory complications were Peri-implantitis (11%), impaired wound healing (7%) mobility (6%), Pain 2%. Bivariate analysis revealed that current tobacco use (P =0.002), staging (P = 0.002), Site (P <0.0245), and the use of reconstructive procedures (P <0.0001) were associated with an increased risk for complications. The multivariate logistic regression analysis was constructed using these patients. For current tobacco use, the odds ratio was 8.7555 (P = .0.0481; 95% confidence interval[CI], 1.0230 to 72.7446) suggesting that smokers were 8.6655 times more likely to have implant complications than non- smokers. The odds ratio for implant staging was 3.7987 (P = 0.0317; 95% CI, 0.5786 to 26.1872), with 1-stage implants having a 3.79 times increased risk for complications. The use of reconstructive procedures was also associated with an increased risk for complications (odds ratio 5.97; P = 0.019; 95% CI, 0.0000 to 0.0000). Placement of dental implants in maxilla has 3.6517 times more likely to have implant complication than mandible. (Odds ratio=3.6487; P=0.020,955CI, 0.4238to31.4108).This is in accordance with study conducted by Nancy E .Mc Dermott et al[11],

they have shown the specific types and frequency of complications. Inflammatory complications (10.2%), prosthetic 2.7%, operative 1% included mobility (4.0%), infection (2.4%), pain (1.6%), peri-implantitis(1.0%), delayed wound healing (0.73%), and gingival recession (0.44%). Slightly over half (52.1%) of the inflammatory complications were major. Based on the bivariate analysis, tobacco use(P=.01), staging(P=.003), prosthesis type(P=.03), and the use of reconstructive procedures(P=.024)were associated with an increased risk for complications. The multivariate model was constructed using these candidate variables as well as age and gender. For current tobacco use, the adjusted hazard ratio was 2.31(P=.0051;95% confidence interval [CI], 1.29 to 4.16) suggesting that smokers are 2.31 times more likely to have implant complications than non smokers. The adjusted hazard ratio for implant staging was 2.56(P=.0013;95%CI,1.45to4.55), with 1-stage implants having an increased risk for complications. The use of reconstructive procedures was also associated with an increased risk for complications (adjusted hazard ratio1.18;P= .017; 95% CI, 1.03 to 1.34). Prior reports have associated smoking, poor oral hygiene, surgical inexperience, lack of attached mucosa, and loose abutment screws with inflammatory complications.

CONCLUSION

The present study identified smoking, 1-stage implants, use of reconstructive procedures and placement of Dental implants in maxilla as risk factors for implant complications .Two of these four risk factors, smoking and 1-stage implants, can be modified to enhance outcome. It is suggested that subsequent studies should be attempted to identify additional risk factors which can be modified to minimize morbidity and enhance patient outcome. Investigations examining the influence of smoking and reconstructive procedures on implant complications are recommended. The findings of our study may be used to decrease the incidence of implant-associated complications and to better assist the patient in selecting the most appropriate treatment option.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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