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Original Research Paper

Clinical Assessment of Peri-Implant Tissue Condition following Reconstruction in Non-Irradiated Jaws: An Observational Study

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ABSTRACT:
Purpose: The objective of this study was to evaluate the state of peri-implant soft tissues in patients who underwent jaw resection followed by reconstruction using autogenous bone grafting, and subsequent rehabilitation with implant-supported prostheses. **Materials and Methods**: A cross-sectional study of 24 patients who underwent surgical reconstruction with autogenous free bone graft for maxilla or mandible and subsequently received implant-prosthetic rehabilitation between August 2020 and April 2023 were selected for assessment in this study. The measured parameters were analyzed in terms of their overall distribution. A total of 352 peri-implant sites of the 88 functional implants were clinically assessed. The assessment was done at the 3rd month after placing the implant, at beginning of prosthetic rehabilitation. **Results**: Among the 88 dental implants placed in 20 patients, 0 implants were removed, although, 21 showed grade 1 level mobility. During the time period of assessment, the implants were not loaded. Therefore, all the implant sites were available for assessment in both removable as well as fixed type of treatment patients. Overall, in this study, the peri-implant soft tissue state was deemed successful for 43 implants, and for 41 implants results were deemed satisfactory. Nevertheless, according to the parameters considered at the time, 4 implants appeared to have compromised survival. **Conclusion**: This study shows that in cases of those implants which were categorized under compromised survival, showed peri-implant tissue problems such as inadequately epithelized margins, deep pockets as well as bleeding on probing and at times suppuration. Even in cases of successfully placed implants predicted for good osseointegration, peri-implant tissue parameters can compromise the survival with the course of time. Within the constraints of the current study, it was shown that placing implants in bone flaps during jaw rehabilitation is a dependable method with a good survival rate.

INTRODUCTION:

The face consists of various bones that have specific functions and also contribute to a person's appearance. These bones provide a framework for eating, facial expressions, breathing, and communication. They also protect the sense organs of smell, sight, and taste. Important facial bones include the mandible, maxilla, frontal bone, nasal bones, and zygoma. These bones have a complex and elegant structure that serves multiple purposes. The maxilla forms the middle part of the face, while the mandible forms the lower one-third. The upper and lower jaws work together for chewing, speaking, and aesthetics. The maxilla supports the nasal tissues and acts as a counterforce to the mandible during movements like swallowing, speech, and chewing (1).

Maxillary and mandibular discontinuity can occur due to various causes such as trauma, congenital malformation, or tumour removal for mandibular or palatomaxillary abnormalities. These conditions often have a significant impact on the patient's form, function, and psychological well-being (1).

The hallmarks of head and neck cancer include a variety of tumors that can develop in or around the sinuses, nose, mouth, or throat (2). The main cause of head and neck cancer (HNC) is attributed to lifestyle factors, and the specific locations where it occurs most frequently can vary by geographic region. In underdeveloped countries, alcohol and tobacco consumption remain significant risk factors for HNC. In India, head and neck cancers constitute 30% of all cancer cases (3). Approximately 90% of head and neck cancers (HNCs) are attributed to squamous cell carcinoma, a type of tumor that originates from the

epithelial lining of the oral cavity, throat, and larynx (4).

Various treatment approaches, which typically involve surgery, radiation therapy, chemotherapy, or a combination of these methods, have been utilized in the treatment of head and neck cancers. A comprehensive approach is required for the treatment of head and neck cancers (HNC), involving multiple disciplines such as pathology, radiology, medical, surgical, and radiation oncology. In addition, supportive services like nutrition, physical and occupational therapy, speech and swallowing therapy, and other supportive services play a crucial role in the multidisciplinary strategy for managing HNC (5). In addition to curing cancer, restoring oral function and appearance that were lost or changed as a result of surgical treatment is another significant goal (6).

The effects of primary oncology surgery can limit the goals of rehabilitation. These effects include changes to oral anatomy, weakened soft tissues, missing or damaged tissues, and bulky flaps. Other issues that may arise include muscle attachment problems, loss of lip control and limited mouth opening (trismus), loss of bone structures and teeth, and changes in facial appearance. Restorative treatment options face challenges in restoring oral function and aesthetics due to issues like insufficient space for a prosthesis, inadequate support, compromised resilience of soft tissues, impaired tongue function, and loss of integrity and competence in the velopharyngeal complex (6). Ablative surgery, both with and without radiation, is the present gold standard of treatment for oral cancer. A range of problems, including altered facial characteristics, broad Oro-nasal apertures, and difficulties with speaking, eating, swallowing, and retaining saliva, may arise after the surgical removal of a tumor (7).

In recent years, there have been substantial advancements in the oral and dental rehabilitation of patients who have undergone mandibular reconstruction. These improvements have primarily been facilitated by advancements in surgical reconstruction techniques. Free tissue transfer, which involves the transfer of bone, muscle, and associated soft tissues, is increasingly utilized for restoring mandibular continuity in cases of ablative cancer procedures and traumatic incidents. A mandibular prosthesis is then supported and retained by the tissues that were used during the reconstructive surgery (8).

The main objective of reconstructive surgery is to bring the surgically ablated jaws back to their premorbid state. Despite the availability of various alternatives, the fibula free flap is widely considered the standard vascularized graft for reconstructing composite or segmental defects in the maxilla and mandible. This preference is attributed to its versatility, predictability, and the ability to harvest it as an osseous, myo-osseous, or osteocutaneous flap (9).

It is crucial to determine if the soft tissue and bone needs are satisfactory prior to implantation. The soft tissue that will cover the inserted bone must be healthy and well vascularized. Patient satisfaction cannot be solely guaranteed by the successful integration of a dental implant into the bone. The health of soft tissues plays a vital role in ensuring effective rehabilitation and patient contentment. Factors such as patient health, the condition of both soft and hard tissues, usage and maintenance of the prosthesis, surgical augmentation and placement, and the design of the final prosthesis collectively influence the healing process around dental implants. The significance of soft tissue in restoring both function and aesthetics with dental implants is often overlooked (10).

Hyperplastic granulomatous reactive tissue that can form around the implant abutments of the prosthesis is a major drawback seen after jaw reconstruction operations. This reconstructed soft tissue lacks the natural mucosa's functionality and physiologic qualities. Additional problems that have been noted include excessive tissue mobility, persistent inflammation, and hypertrophy, all of which compromise the success of implants (11).

Considering the above-mentioned limitations, this study intends to assess the health and quality of peri implant soft tissue based on various factors such as- attachment and mobility, keratinized soft tissue coverage around implant, probing depth, amount of bone loss and proliferation of tissue following reconstructive surgery in non-irradiated jaws.

MATERIALS AND METHODS:

List of factors considered in this study for the assessment of soft tissue:

Bleeding on probing:

Aassessment of bleeding on probing was done using University of Michigan ‘o’ probe. The probe is carefully and gently introduced till the length of the pocket depth and moved laterally along the border. Sometimes bleeding appears immediately after the removal of the probe or it can appear delayed, after a few seconds.

Pocket Depth:

Probing depth was calculated using a University of Michigan ‘o’ probe on mesial, distal, lingual and buccal sites and then the mean probing depth is calculated for each implant placed in the reconstructed part of the jaw. For the assessment of pocket depth

around dental implants a University of Michigan ‘o’ probe: Periodontal instrument with markings – 1,2,3,5,7,8,9,10 mm was used.

Suppuration:
The presence/absence of Suppuration was recorded at 4 sites per implant (Mesial, distal buccal and lingual) with a light vertical probe.(12).

Mobility:
The mobility of implants was evaluated using the clinical implant mobility scale by Misch and Silc scale. (13). To assess mobility, two rigid instruments were employed to apply a labiolingual force of approximately 500 g from opposing sides of the implant.

Granulation tissue:
All the implants were clinically observed for the presence or absence of granulation tissue (exuberant and extremely soft tissue) around implant.

Incisional margin:
the incisional margin was assessed clinically to check for exposure of connective tissue or loss of epithelization noted along the margin of the grafted tissue.

METHODOLOGY:

24 patients who underwent reconstruction with autogenous free bone graft for maxilla or mandible and subsequently received implant-prosthetic rehabilitation between August 2020 and April 2023 were selected for assessment in this study. Of these patients, 20 were undergoing prosthetic rehabilitation and were included in the study and 4 were excluded because they had only just completed stage I implant surgery. The assessment was done at the 3rd month after placing the implant, at beginning of prosthetic rehabilitation.

The study included a total of 20 participants, consisting of 11 males and 9 females, with ages ranging from 20 to 64 years (mean age: 38.5 years). Among them, 5 cases involved maxillary resection, while 15 cases involved mandibular resection. The surgical procedures for jaw resection predominantly involved partial resection in the maxilla and segmental mandibulectomy in the mandible. Among the patients, approximately two-thirds underwent jaw surgery for odontogenic tumors, while the remaining cases were related to oral malignancies and congenital anomalies like ectodermal dysplasia. None of the patients received additional adjuvant radiotherapy. A summary of the clinical data of the patients in the study is given in (Table1).

Exclusion criteria for implant therapy were: signs of recurrence in the operated area; periodontal disease of the residual dentition; inadequate intermaxillary relationship after the reconstruction; inadequate oral hygiene; non-cooperating patients; radiotherapy after the reconstruction; heavy smokers; alcohol abuse.

The choice of revascularized flaps or bone grafts was dictated by the extension of the defect following resection, the quality and quantity of residual soft tissues and the presence of previous radiotherapy.

Dental Implants and Prosthesis:
In the rehabilitated patients, a total of 88 dental implants were successfully placed, with 23 implants in the maxillary region and 65 implants in the mandibular region. The average time for the implants to be uncovered after placement was 3 months. In terms of the opposing occlusion, 14 subjects had a complete arch of natural teeth, while the remaining 6 had either removable or fixed prostheses.

A retrospective review of clinical records was conducted for all patients, and pertinent data concerning demographic information, medical history, surgical procedures, implant details, and prosthodontic aspects of their treatment were analyzed. Subsequently, the patients were invited for a clinical assessment to evaluate the condition of the peri-implant tissue.

Peri-implant crevicular probing depth and crevicular bleeding on probing were assessed for each participant using a Michigan 'o' probe. Measurements were obtained at four sites of each implant abutment, and the average value was calculated. Crevicular bleeding on probing was recorded as either positive or negative.

The stability of individual implant abutments was clinically evaluated by assessing mobility after removing the overdenture and attachment device. The incisional margin was assessed based on the exposure of connective tissue, and the presence or absence of granulation tissue around the implant was noted. In order to ensure consistency, all clinical measurements in the study were performed by a single author. Criteria for evaluating the success of endosseous implants placed in reconstructed jaws were established. These criteria were developed by taking into account existing standards in the literature for conventional implant case.

Pt.	Age	Gender	Diagnosis	Treatment	Jaw	No. Of implants
1	34	M	Unicytic ameloblastoma mandible	Segmental mandibulectomy + rib graft with reconstruction plate	Mandible	4
2	20	M	Juvenile Ossifying Fibroma/ Aneurysmal bone cyst	Segmental mandibulectomy + right free fibula flab reconstruction	Mandible	5
3	56	F	Squamous cell carcinoma	Vestibuloplasty + mucosal graft	Mandible	4
4	28	F	Ameloblastoma	Mental nerve anastomosis, Le Fort I step osteotomies	Mandible	4
5	45	F	Cemento-ossfying fibroma	Mandibular arch reconstruction with Free Fibula Flap	Mandible	6
6	25	F	Plexiform ameloblastoma	Segmental mandibulectomy with Free Fibula Flap	Mandible	5
7	30	F	Primary intraosseous carcinoma	Mandibular reconstruction with Free Fibula Flap	Mandible	5
8	42	M	Squamous cell carcinoma	Subantral approach infrastructure maxillectomy left side with debridement of dead tissue	Maxilla	6
9	53	M	Ameloblastoma	Mandibular reconstruction with Free Fibula Flap	Mandible	4
10	42	M	Recurrent oral keratosis	Segmental mandibulectomy reconstruction with Free Fibula Flap	Mandible	2
11	33	F	Squamous cell carcinoma	Mandibular reconstruction with Free Fibula Flap	Mandible	3
12	47	M	Mucoepidermoid carcinoma	Le Fort I step osteotomy	Maxilla	5
13	32	F	Ectodermal dysplasia	Mandibular reconstruction with Free Fibula Flap	Mandible	6
14	54	M	Squamous cell carcinoma	Mandibular reconstruction with Free Fibula Flap	Mandible	5
15	64	M	Ameloblastoma mandible	WLE+ segmental mandibulectomy reconstruction with Free Fibula Flap	Mandible	5
16	47	F	Mucormycosis of paranasal sinuses with midface deformity	Sublabial approach infrastructure maxillectomy both sides with debridement of dead tissue	Maxilla	5
17	47	M	Primary intraosseous carcinoma	Mandibular reconstruction with Free Fibula Flap	Mandible	4
18	61	M	Squamous cell carcinoma	Sublabial approach infrastructure maxillectomy	Maxilla	4
19	50	M	Ameloblastoma	Mandibular reconstruction with Free Fibula Flap	Mandible	3
20	49	F	Plexiform ameloblastoma of maxilla	Right infrastructure maxillectomy reconstruction with Free Fibula Flap	Maxilla	3

Table 1: Summary of data collected from patients

STATISTICAL ANALYSIS:

To test the statistically significant comparison of peri-implant tissue following reconstructive surgery in non-irradiated maxilla and mandible, among the follow-up, Wilcoxon Signed rank test was used for continuous variables and McNemar chi square test was used for categorical variables.

RESULTS:

The following results were obtained after evaluation:

Peri-implant Probing depth:

The distribution of probing depths (range 3 to 8 mm) measured around the dental implants are shown in fig 6.1. Horizontal axis denotes the range of probing depth noted which was 3mm minimum to 8 mm maximum. Vertical axis shows the number of implants showing the particular measurement of probing depth. Probing depth is calculated in millimetres. (Table 2) (Figure 1).

N	Valid	88
	Missing	0
Mean		5.76
Std. Deviation		1.232
Minimum		3
Maximum		8

Table 2

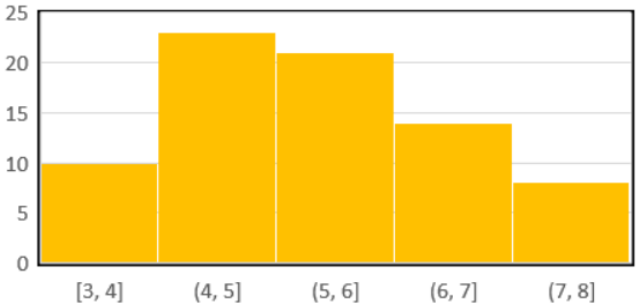

Figure 1

A mean probing depth of 5.76 mm was observed. Probing depth greater than 5mm was noted in 52.2% of the peri-implant sites

Bleeding on probing:

61.4% of the implants did not show bleeding on probing. Among the remaining 38.6%, more implant sites showed delayed bleeding on probing, that is after a few seconds of probing as compared to those that showed immediate bleeding after probing (Table 3).

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	54	61.4	61.4	61.4
	1	34	38.6	38.6	100.0
	Total	88	100.0	100.0	

Table 3

Reference scale:		
	1	present
	0	absent

Suppuration:

Suppuration was not observed (Grade 0) in any of the 4 sites of each implant (mesial, distal, buccal and lingual) in 95.5% of the implants that were assessed. In 3.4% sites, grade 1 suppuration was observed (suppuration manifesting ≥ 15 seconds after gentle probing or suppuration at a single spot (dot)) and in 1.1%, grade 2 suppuration (Suppuration manifesting < 15 seconds after gentle probing or profuse suppuration (drop or line) forming a confluent line) was observed (Table 4).

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	84	95.5	95.5	95.5
	1	3	3.4	3.4	98.9
	2	1	1.1	1.1	100.0
	Total	88	100.0	100.0	

Table 4

Reference scale:

0	no SUP or non-suppurative exudate
1	SUP manifesting ≥ 15 seconds after gentle probing or SUP at a single spot (dot)
2	SUP manifesting < 15 seconds after gentle probing or profuse SUP (drop or line) forming a confluent line
3	spontaneous SUP manifesting through the peri-implant sulcus upon palpation/compression of the peri-implant soft tissues

Mobility:
73.9% of the implants that is 65 implants did not show any mobility on checking clinically indicating success in osseointegration. 23% of the implants showed grade 1 mobility clinically, that is slight detectable movement in horizontal direction. 2% showed grade 2 mobility meaning moderate visible horizontal mobility up to 0.5mm indicating compromised osseointegration (Table 5).

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	65	73.9	73.9	73.9
	1	21	23.9	23.9	97.7
	2	2	2.3	2.3	100.0
	Total	88	100.0	100.0	

Table 5

Reference scale:

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

Granulation tissue:
76.1% of the implants did not present with granulation tissue. 23.9% showed the presence of granulation tissue among which majority had mild tissue development around the implant border and a few showed moderate level of granulation tissue development (Table 6).

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	67	76.1	76.1	76.1
	1	21	23.9	23.9	100.0
	Total	88	100.0	100.0	

Table 6

Reference scale:	1	present
	0	absent

Incisional Margin:
Among the 88 implants observed, 90.9% of them did not show exposure of connective tissue indicating complete epithelization. However, 9.1% that is 8 implants showed exposure of connective tissue at the margin of the implant indicating incomplete/ hampered epithelization (Table 7).

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	8	9.1	9.1	9.1
	3	80	90.9	90.9	100.0
	Total	88	100.0	100.0	

Table 7

Reference scale:	1	not epithelialized, with loss of epithelium beyond incision margin
	2	not epithelialized, with exposed connective tissue
	3	no exposed connective tissue

Tissue color:
On observing clinically, 35.2% of the soft tissue around implant showed healthy pink tissue. 54% of the implants showed grade 4 that is < 25% of red gingiva, 9.1% showed grade 3 that is 25 - 50% of red gingiva and only 1.1% showed more than 50% of red gingiva i.e grade 2 (Table 8).

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	1	1.1	1.1	1.1
	3	8	9.1	9.1	10.2
	4	48	54.5	54.5	64.8
	5	31	35.2	35.2	100.0
	Total	88	100.0	100.0	

Table 8

Reference scale:	1	≥ 50% of red gingiva
	2	= 50% of red gingiva
	3	25 - 50% of red gingiva
	4	< 25% of red gingiva
	5	all pink tissues

Based on the above soft tissue factors, the implants were analysed taking reference of Healing Index of Landry, Turnbull and Howley (Table 4.4) and implant quality scale which categorizes the implant in 4 different groups i.e., success, satisfactory survival, compromised survival or failure.

Implant quality Scale:
48.9% of the implants fell in Category 1 that is success or optimum health of dental implants as there was pain or tenderness upon function, 0 mobility and No exudates history. 46.6% of the implants fell in category 2 which indicates satisfactory survival due to increased probing depth although even they did not have pain on function or exudate history. 4.5% implants fell in category 3 which is Compromised survival due probing depth >/= to 7mm and flight sensitivity on function (Table 9). (14)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	43	48.9	48.9	48.9
	2	41	46.6	46.6	95.5
	3	4	4.5	4.5	100.0
	Total	88	100.0	100.0	

Table 9

Reference scale:

1	Success (optimum health)
2	Satisfactory survival
3	Compromised survival
4	Failure (clinical or absolute failure)

Healing index:
On observing the healing of the soft tissues based on the 1above-mentioned factors, 60.2% fell in the category of very good to excellent healing, 20.5% showed good healing progress and only 2.3% showed poor healing due to incomplete epithelization at the margin and more than 50% of red gingiva (Table 10). (15)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	2	2.3	2.3	2.3
	3	18	20.5	20.5	22.7
	4	33	37.5	37.5	60.2
	5	35	39.8	39.8	100.0
	Total	88	100.0	100.0	

Table 10

Reference scale:

1	Very Poor: 2 or more signs are present
2	Poor
3	Good
4	Very good
5	Excellent

DISCUSSION:

The objective of oral rehabilitation is to fulfil both functional and aesthetic goals. In particular, dental prosthetic rehabilitation focuses on enhancing oral aesthetics, which is now recognized as the primary objective of reconstructive procedures.(16) The illiac crest flap or fibula flap is widely used for the reconstruction of both hard and soft tissues. In these cases, implant supported rehabilitation is more effective because it provides greater stability for the prosthesis (17). By incorporating endosseous implants after the transplantation of vascularized free bone flaps, the possibility of jaw restoration in patients with oral malignancies is significantly enhanced. Among the available flap options, the fibula flap offers several advantages and is often the preferred choice for treatment. When combined with free fibula flaps, the placement of implants allows for secure rehabilitation and yields excellent clinical outcomes (7).

Various studies compare the prognosis rates of implants placed in reconstructed jaws with those placed in otherwise healthy individuals. When compared to implants placed into local bone in healthy subjects, research by Kramer et al. found no appreciable difference in the success rate of implants placed into fibula flaps. This finding demonstrates that vascularized fibula grafts are biologically capable of osseointegrating implants and that their potential is comparable to that of local mandibular or maxillary bone. Additionally, there were no appreciable differences in the survival rates of implants in vascularized grafts obtained from various donor sites (18). In a separate study conducted by Chiapasco et al., it was observed that the cumulative success rate and survival rate of implants placed in fibula flaps were 98.6% and 93.1% respectively, at the conclusion of the follow-up period (19) Jacobsen et al., in a study involving 23 patients who received 140 implants,

reported 1-year and 5-year implant survival rates of 94% and 83% respectively. However, when non-irradiated fibula bone grafts were used, the survival rate was noted to be 86%. (20)

Various other studies also yield similar results to each other when it comes to the success and survival rate based on osseointegration of dental implants placed in reconstructed jaws with vascularized free flaps. However, there have been only a few investigations that have looked into the peri-implant soft tissue health of tumor patients (post malignancy); in addition, those who have studied it have only looked at a limited sample size. Betz et al. evaluated a larger group of 32 patients but did not use the necessary periodontal markers, and their findings were based solely on a 3-year observation period (21). The emergence of gingival hyperplasia surrounding dental implants on osteomyocutaneous free flaps used to repair face features is another specific type of problem that has been documented in the literature (17).

In the present study, various parameters were utilized to evaluate the soft tissue surrounding dental implants. These findings were consistent with the results reported in similar studies. A study conducted by Lim K Cheung et al. compared the plaque index, pocket probing depth, and bleeding on probing of the peri-implant soft tissues with those of natural teeth used as controls in the same patients. A total of 127 implant sites were analyzed, revealing probing depths ranging from 0 to 7 mm. About 47.3% of the peri-implant sites exhibited probing depths greater than 3 mm, which was higher compared to the control group. However, there was no significant difference observed in terms of bleeding upon probing. With the exception of crevicular probing depth, the researchers concluded that there were no noticeable disparities in the measured clinical parameters between the implants and the control teeth (22).

In this study, A mean probing depth of 5.76 mm was observed. Probing depth greater than 5mm was noted in 52.2% of the peri-implant sites. In comparison to other studies, this mean value is high. A wide range of variables, including pocket access, patient reaction, probe form, and probing force, are linked to probing depth data and can lead to measurement inaccuracies. For the purpose of minimizing mistakes, it must be noted that the author performed all measurements for this study. The comparatively thick transplanted soft tissues that surround roughly half of the implants and impair peri implant cleanliness can be used to explain the relatively high values for the pocket probing depth. But eventually, the readings got to the point where they were below the 4 mm threshold that researchers who use this metric as a success criterion demand. According to Betz et al., patients with tumors had mean probing depths of 5.1 mm as opposed to 3.4 mm (22).

Suppuration around implants is seen as an early sign of peri-implantitis. It has been demonstrated to be a likely outcome in cases of progressive bone loss and peri-implant disease in clinical trials on the clinical manifestations of peri-implantitis.

In this study, mild granulation tissue was clinically observed in 23.9% of the implants, while the remaining 76.1% showed no signs of hyperplasia. Brauner et al., in their case report series on Gingival Hyperplasia Around Dental Implants in Jaws Reconstructed with Free Vascularized Flaps, conducted a clinical analysis of this complication and proposed management strategies. They utilized traditional techniques like a cold scalpel, electric cautery, or laser to address gingival hyperplasia. The researchers concluded that the occurrence of gingival hyperplasia was not influenced by the type of prosthetic rehabilitation (provisional vs. definitive or screwed vs. cemented), as it was observed in all of these scenarios. While this specific complication did not directly lead to resorption of peri-implant bone, it could contribute to compromised oral hygiene, potentially leading to the development of periimplantitis (17).

Swelling, redness of the marginal tissues, and bleeding upon gentle probing are common signs of peri-implant infection. The correlation between bleeding on probing over multiple visits and subsequent loss of attachment has been investigated in a longitudinal trial. Although bleeding on probing did not emerge as a dependable predictor of disease activity, the absence of bleeding was deemed clinically valuable in indicating periodontal stability. While parameters established for natural teeth may not directly apply to peri-implant tissues, it remains reasonable to define peri-implant parameters based on periodontal indices (23). The intricate nature of ablative jaw surgery and its impact on orofacial anatomy and physiology have led certain clinicians to adopt an alternative evaluation approach for assessing treatment outcomes in patients undergoing implant rehabilitation. This approach takes into account the unique challenges posed by postsurgical variations, distinguishing these cases from conventional implant treatments. (24).

Limitations:

There are certain limitations to this study.

1. Assessment of the mentioned parameters was done during the period of prosthetic rehabilitation before the final prosthesis was inserted. Therefore, the long-term effect on soft tissues and implants post functional loading of the implants could not be evaluated.

2. Sample size for this study was 20 patients where in 88 implants were evaluated. The achieved result could be applied to a larger sample size using the same parameters to overcome the limitations of the current study.
3. The assessment of soft tissue was performed for individual implants. In a single patient a combination of these parameters exist which can influence the overall implant quality scale and healing index of the patient.

Given the shortcomings in the study design, the results from the current investigation should be evaluated carefully. Additionally, it is important to keep in mind that the clinical examinations were only recorded by one examiner, which may have caused bias.

CONCLUSION:

In this study, certain criteria for evaluating soft tissue were shared with conventional cases, while others were adjusted or adapted accordingly. Overall, the peri-implant soft tissue state was deemed successful for 43 implants, and for 41 implants results were deemed satisfactory and consistent with those of other researches. Nevertheless, according to the parameters considered at the time, 4 implants appeared to have compromised survival.
This study shows that in cases of those implants which were categorized under compromised survival, showed peri-implant tissue problems such as inadequately epithelized margins, deep pockets as well as bleeding on probing and at times suppuration. Even in cases of successfully placed implants predicted for good osseointegration, peri-implant tissue parameters can compromise the survival with the course of time. This study revealed a good percentage of implants that did not exhibit mobility, bleeding on probing and granulation tissue. This indicates that, for adequate or successful survival and healing, the peri-implant tissue care and evaluation go hand in hand with successful osseointegration. Within the constraints of the current study, it was shown that placing implants in bone flaps during jaw rehabilitation is a dependable method with a good survival rate. This study can provide foundational data for future multicenter, randomized controlled clinical trials and extended-duration studies in this field. Further research of this nature is necessary before establishing clinical guidelines for implant therapy protocols during oral rehabilitation with bone flaps.

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