



ISSN: 0975-833X

Available online at <http://www.journalcra.com>

International Journal of Current Research
Vol. 11, Issue, 04, pp.3061-3064, April, 2019

DOI: <https://doi.org/10.24941/ijcr.34915.04.2019>

INTERNATIONAL JOURNAL
OF CURRENT RESEARCH

RESEARCH ARTICLE

A STUDY TO EVALUATE THE CLINICAL PERFORMANCE OF ANTERIOR FIBER REINFORCED COMPOSITE-FIXED PARTIAL DENTURES ORIGINAL ARTICLE

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ARTICLE INFO

Article History:

Received 09th January, 2019
Received in revised form
16th February, 2019
Accepted 13th March, 2019
Published online 30th April 2019

Key Words:

Missing anterior teeth, Fiber reinforced composite-fixed partial dentures, Clinical performance, USPHS criteria.

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Citation: Dr. Yamuna, V., Dr. Roseline Meshramkar, Dr. Lekha, K. and Dr. Ramesh, K. Nadiger, 2019. "Socio-economic characteristics of farmers in five agrarian communities in Anambra state, South-eastern Nigeria", *International Journal of Current Research*, 11, (04), 3061-3064.

ABSTRACT

Restoration of missing anterior teeth has wide range of treatment options. Fixed economic esthetic restorations are challenging. With the advancements in the dental material science and major improvements in adhesive dentistry, gave clinicians with an option of fiber reinforced composite-fixed partial dentures. They are economical, esthetically pleasing and metal free restorations. This study was carried out to evaluate the clinical performance of anterior fiber reinforced composite-fixed partial dentures using USPHS criteria.

INTRODUCTION

Missing anterior teeth is an important concern to the patients both esthetically and functionally. There are various reasons for missing anterior teeth with wide restorative options ranging from removable prosthesis to fixed prosthesis (Jokstad Asbjorn *et al.*, 2015). Composite resins show superior esthetics with proper handling but brittle. With development of dental material science, it has become possible to use composite resins in fabrication of fixed dental prosthesis by reinforcing with fibers (Freilich *et al.*, 2018; Krejci *et al.*, 1988; Singh *et al.*, 2014). The fiber reinforced composite-fixed partial dentures were proved to have high fracture resistance by invitro study⁵. Also the fiber reinforced composite-fixed partial dentures found to be a good alternative to cast metal resin-bonded fixed dental prosthesis with satisfactory esthetics, biological and functional performance (Stiesch-Scholz *et al.*, 2016) through their higher structural strength and stiffness (Li *et al.*, 2004). The fiber reinforced composite-fixed partial dentures have provided dentists an option of chairside tooth replacements with minimally invasive procedure (Ahlstrand Wisua and Finger Werner, 2002). Many patients are treated with fiber reinforced composite-fixed partial dentures for missing teeth. But there are very few literature evidence on the longevity of the fiber reinforced composite-fixed dental prosthesis. So, this study was designed to evaluate the clinical performance of fiber reinforced composite-fixed partial dentures.

MATERIALS AND METHODS

Source of the data: 10 patients with missing anterior teeth were selected based on the inclusion and exclusion criteria as given below from the Department of Prosthodontics OPD of SDM Dental College, Dharwad.

Inclusion Criteria

- Patients who desire an minimally invasive esthetic restoration.
- Abutment teeth with minimal to no existing restorations.
- Abutment teeth that are acceptable in shape, position, and color.
- Abutment teeth with enough buccolingual thickness.
- Teeth in occlusion to antagonistic teeth.

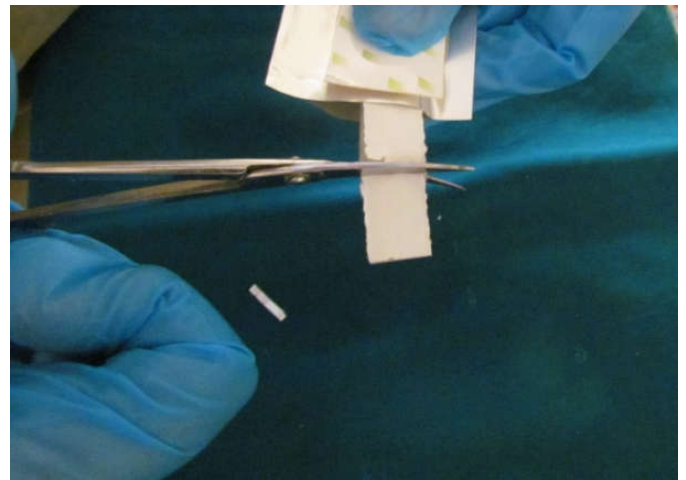
Exclusion criteria

- Severe systemic diseases or allergies or severe salivary gland dysfunction
- Unacceptable standard of oral hygiene
- Parafunctional habits
- Severe periodontal problems
- Non vital teeth
- Identifiable pulpal inflammation or pain before treatment
- Teeth subjected to direct pulp-capping

Method of data collection: The palatal or lingual surface of the anterior teeth on either side of the edentulous space was acid etched and application of bonding agent was carried out as per manufacturer's instruction. Composite was placed and Everstick C and B fiber was cut as per the requirement and cured in place. Preshaped acrylic tooth will be used as pontic and fixed with the fiber using composite. At regular intervals, patients were followed up to check for the presence of secondary caries, marginal adaptation, marginal discoloration, colour match, anatomic form, surface roughness, fracture of the restoration, fracture of the tooth and retention of the restoration as per United States Public Health Service (USPHS) criteria (Arcangelo *et al.*, 2012 and 2014; Cvar JF, Ryge, 2005; Huth *et al.*, 2012)

RESULTS

A total of 10 patients were treated using fiber reinforced composite-fixed partial denture for single missing anterior teeth by adhering to the inclusion and exclusion criteria of the study design. All the patients were followed up after 3 months, 6 months, 9 months, 12 months and 24 months. At the end of 3 months and 6 months, all the fiber reinforced composite-fixed partial dentures showed functionally and esthetically. At the end of 9 months, 4 fiber reinforced composite-fixed partial dentures had surface roughness. One fiber reinforced composite-fixed partial denture got debonded and it was rebonded again using composite resin. At the end of 12 months, one fiber reinforced composite-fixed partial denture got debonded and it was rebonded again using composite resin. At the end of 24 months, 6 fiber reinforced composite-fixed partial denture was providing good esthetics and in satisfactory function.



Cutting the fiber of desired length



Selected acrylic tooth and cut fiber



Pre-operative view



Acrylic tooth bonded using fiber and composite resin

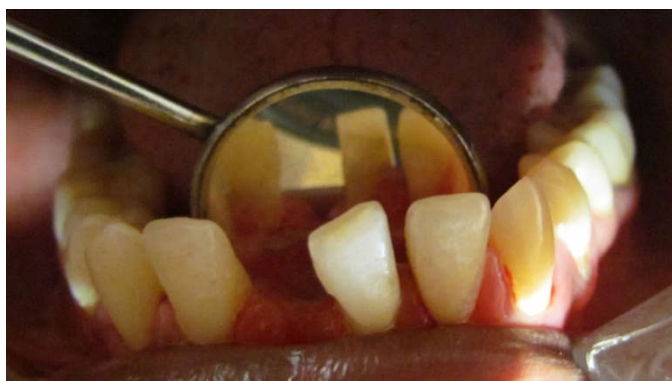


Image of the edentulous site



Intraoral view after 24 months of follow up

Table 1. USPHS assessment for fiber reinforced composite – fixed partial denture – after 3 months

UPHSC Criteria	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7	Case 8	Case 9	Case 10
Secondary caries	0	0	0	0	0	0	0	0	0	0
Marginal adaptation	0	0	0	0	0	0	0	0	0	0
Marginal discolouration	0	0	0	0	0	0	0	0	0	0
Colour match	0	0	0	0	0	0	0	0	0	0
Anatomic form	0	0	0	0	0	0	0	0	0	0
Surface roughness	0	0	0	0	0	0	0	0	0	0
Fracture of the restoration	0	0	0	0	0	0	0	0	0	0
Fracture of the tooth	0	0	0	0	0	0	0	0	0	0
Retention of the restoration	0	0	0	0	0	0	0	0	0	0

Table 2. USPHS assessment for fiber reinforced composite – fixed partial denture – after 6 months

UPHSC Criteria	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7	Case 8	Case 9	Case 10
Secondary caries	0	0	0	0	0	0	0	0	0	0
Marginal adaptation	0	0	0	0	0	0	0	0	0	0
Marginal discolouration	0	0	0	0	0	0	0	0	0	0
Colour match	0	0	0	0	0	0	0	0	0	0
Anatomic form	0	0	0	0	0	0	0	0	0	0
Surface roughness	0	0	0	0	0	0	0	0	0	0
Fracture of the restoration	0	0	0	0	0	0	0	0	0	0
Fracture of the tooth	0	0	0	0	0	0	0	0	0	0
Retention of the restoration	0	0	0	0	0	0	0	0	0	0

Table 3. USPHS assessment for fiber reinforced composite – fixed partial denture – after 9 months

UPHSC Criteria	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7	Case 8	Case 9	Case 10
Secondary caries	0	0	0	0	0	0	0	0	0	0
Marginal adaptation	0	0	0	0	0	0	0	0	0	0
Marginal discolouration	0	0	0	0	0	0	0	0	0	0
Colour match	0	0	0	0	0	0	0	0	0	0
Anatomic form	0	0	0	0	0	0	0	0	0	0
Surface roughness	0	1	1	0	0	0	0	0	1	1
Fracture of the restoration	0	0	0	0	0	0	0	0	0	0
Fracture of the tooth	0	0	0	0	0	0	0	0	0	0
Retention of the restoration	0	0	0	0	1	0	0	0	0	0

Table 4. USPHS assessment for fiber reinforced composite – fixed partial denture – after 12 months

UPHSC Criteria	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7	Case 8	Case 9	Case 10
Secondary caries	0	0	0	0	0	0	0	0	0	0
Marginal adaptation	0	0	0	0	0	0	0	0	0	0
Marginal discolouration	0	0	0	0	0	0	0	0	0	0
Colour match	0	0	0	0	0	0	0	0	0	0
Anatomic form	0	0	0	0	0	0	0	0	0	0
Surface roughness	0	1	1	0	0	0	0	0	1	1
Fracture of the restoration	0	0	0	0	0	0	0	0	0	0
Fracture of the tooth	0	0	0	0	0	0	0	0	0	0
Retention of the restoration	0	0	0	0	1	1	0	0	0	0

Table 5. USPHS assessment for fiber reinforced composite – fixed partial denture – after 24 months

UPHSC Criteria	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7	Case 8	Case 9	Case 10
Secondary caries	0	0	0	0	0	0	0	0	0	0
Marginal adaptation	0	0	0	0	0	0	0	0	0	0
Marginal discolouration	0	0	0	0	0	0	0	0	0	0
Colour match	0	0	0	0	0	0	0	0	0	0
Anatomic form	0	0	0	0	0	0	0	0	0	0
Surface roughness	0	1	1	0	0	0	0	0	1	1
Fracture of the restoration	0	0	0	0	0	0	0	0	0	0
Fracture of the tooth	0	0	0	0	0	0	0	0	0	0
Retention of the restoration	2	2	0	0	1	1	2	2	0	0

DISCUSSION

The advancements in the material science of dentistry led to the use of composite in replacement of missing teeth by reinforcing with fibers and thereby increasing its strength. The composite fiber reinforced-fixed dental prosthesis helped the dentists to restore missing teeth using metal free restoration with satisfactory esthetics and cost effective fixed restoration. This study was done in 10 patients who reported with chief complaint of single missing anterior teeth.

All the 10 patients were followed up for a period of 2 years at 3 months, 6 months, 9 months, 12 months and 24 months. Assessed using USPHS criteria. Till 6 months follow up, there was no problem detected. At the end of 9 months, slight surface roughness was seen in 4 restorations and debonding of one restoration was found. The debonded restoration was rebonded in place using composite resin. At the end of 12 months, one restoration got debonded but the same was rebonded using composite resin. At the end of 24 months, 6 out of 10 restorations are successful with satisfactory esthetics. The

number of samples were less with no homogeneity in sample distribution between maxilla and mandible. Therefore the results obtained from this study can be considered preliminary to contribute to the evolving knowledge on fiber reinforced composite restorations. The present study results are in accordance with the results of Wolff *et al.* (2018). They stated that the common cause for failure of the restorations as debonding and periodontal health was not affected because of the use of the fiber reinforced restoration-fixed partial dentures.

A short term clinical observational study by Izgi *et al.* (2011) showed that directly fabricated fiber reinforced composite-fixed partial dentures had mean survival period of 19 and 31 months but required minimal abutment preparation. The findings from the present study also seem to be coinciding with the findings of Frese *et al.* (2014). They suggested that the common cause for the failure of the fiber reinforced composite-fixed partial dentures are debonding with good esthetics. But the clinical survival is not improved by the higher fiber fraction. Kumbuloglu and Ozcan (2015) also showed that fiber reinforced composite-fixed partial dentures commonly fail due to debonding which is similar to the results of the present study. The present study results also support the findings of Malmstrom *et al.* (2015) where they stated that the success rate does not depend on the location of the missing tooth, retention type or fiber material. The use of preshaped acrylic teeth in the present study was supported by Perea *et al.* (2014). They said that the composite filling material along with preshaped acrylic resin teeth found to have good ability to withstand masticatory forces. The advantages of the present study are less time consuming, chairside technique, esthetically pleasing and good short term alternative especially to replace missing anterior teeth (preferably mandible).

Conclusion

From the present study, the following conclusions can be made

- a) Utilization of direct technique along with preshaped acrylic teeth using fiber reinforced composite-fixed partial dentures to replace a missing anterior tooth is an immediate, cost effective, metal free and time saving restorative procedure.
- b) Further studies required on the longevity assessment of prosthesis and also methods and adhesive systems to prevent the debonding of the prosthesis.

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