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RESEARCH ARTICLE

A cross-sectional study on the function of dental restoration materials in oral mucosal lichenoid lesions

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Abstract

Background: Dental restoration materials are becoming more widely acknowledged as probable causes of oral lichenoid lesions (OLL), which pose a serious clinical problem in oral medicine. It is yet unclear how particular restorative materials relate to the emergence of oral mucosal lichenoid responses.

Goal: To assess how different dental restoration materials relate to the incidence of oral mucosal lichenoid lesions in patients who visit Katihar Medical College & Hospital's Department of Dentistry.

Methods: Over the course of 18 months (January 2023 to June 2024), 60 patients with a diagnosis of oral lichenoid lesions participated in a cross-sectional observational study. Histopathological study, thorough clinical evaluation, and thorough documenting of dental restorations were all carried out. SPSS version 25 was used for statistical analysis.

Results: The mean age of the 60 patients was 52.4 ± 12.8 years, with 38 (63.3%) being female and 22 (36.7%) being male. Forty-two patients (70%), of whom 31 (73.8%) had lesions directly in touch with amalgam surfaces, had amalgam restorations. 18 patients (64.3%) had contact-related lesions, while 28 patients (46.7%) had composite restorations. The largest association rate was found in metal-ceramic crowns, when 15 out of 18 patients (83.3%) had nearby lesions.

Conclusion: There is a strong correlation between oral lichenoid diseases and dental replacement materials, especially amalgam and metal-ceramic restorations. For the sake of patient treatment, restoration-related lichenoid responses must be identified early and managed appropriately.

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Keywords: Oral lichenoid lesions, dental amalgam, restoration materials, oral mucosa, contact hypersensitivity

INTRODUCTION

A diverse group of inflammatory conditions affecting the oral mucosa, oral lichenoid lesions (OLL) share clinical and histological characteristics with oral lichen planus (OLP) (1). OLL often correlates with recognisable triggering factors, such contact allergens, drugs, and tooth restoration materials, in contrast to OLP, which is considered an autoimmune illness with an unknown origin (2).

Distinguishing between idiopathic oral lichen planus and lichenoid lesions is clinically significant because, in lichenoid reactions, the lesions often resolve when the causal substance is removed (3). Oral lichenoid reactions have been linked to dental restoration materials, particularly amalgam that contains mercury, through both systemic hypersensitivity pathways and local contact irritation (4).

Globally, the average incidence of oral lichenoid lesions varies; rates in various populations have been found to range from 0.5% to 2.6% (5). Few studies have examined the connection between oral lichenoid diseases and dental restorations in the Indian subcontinent, underscoring the necessity for regionally relevant research (6).

In order to shed light on regional incidence and trends of this condition, this study intends to assess the relationship between different dental restoration materials and oral mucosal lichenoid lesions in patients undergoing treatment at Katihar Medical College & Hospital.

MATERIALS AND METHODS

Study Design and Setting

From January to April of 2024, a cross-sectional observational study was carried out at the dental department of Katihar Medical College & Hospital in Katihar, Bihar, India. 60 patients with oral lichenoid lesions who were seen in the outpatient department were part of the study population.

Convenience sampling was used to choose patients based on inclusion and exclusion criteria.

Inclusion Criteria:

Patients who are 18 years of age or older, have at least one dental repair, have a clinical diagnosis of oral lichenoid lesions verified by histological examination, and have given written informed consent to participate are the requirements for inclusion.

Criteria for Exclusion:

Pregnancy and lactation; patients with systemic diseases known to induce lichenoid reactions; current medication use linked to lichenoid drug reactions;

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patients incapable of giving informed permission; Recent history of oral surgery or trauma

Clinical Examination

Comprehensive oral examination was performed by two calibrated examiners (inter-examiner reliability κ = 0.89) under standardized LED lighting conditions using dental unit light and additional handheld LED torches. Digital photographs were taken using a Canon EOS camera with macro lens for documentation and later analysis. The following parameters were systematically recorded:

1. **Demographic data:** Age, gender, occupation, socioeconomic status, medical history, family history
2. **Lesion characteristics:** Location (buccal mucosa, gingiva, tongue, lips, palate), size (measured using periodontal probe), clinical appearance (reticular, erosive, plaque-like, atrophic), bilateral/unilateral presentation
3. **Restoration inventory:** Type (amalgam, composite, metal-ceramic, gold, glass ionomer), location (tooth number), age of restoration (obtained from patient history and dental records), condition (intact, fractured, overhang, marginal gap)
4. **Anatomical relationship:** Direct contact between restorations and lesions (measured as <5mm proximity), galvanic potential assessment
5. **Oral hygiene status:** Plaque index, gingival index, calculus deposits
6. **Symptom assessment:** Pain intensity (Visual Analog Scale 0-10), burning sensation, taste alteration, functional impairment

Restoration Assessment Criteria

Each restoration was evaluated for:

- **Material composition:** Confirmed through patient records and visual/tactile examination
- **Age determination:** Based on patient history, dental records, and clinical appearance
- **Surface condition:** Smooth, rough, corroded, or fractured
- **Marginal integrity:** Presence of gaps, overhangs, or deficiencies
- **Galvanic activity:** Assessed using digital multimeter when multiple metals were present.

Histopathological Examination

All patients had incisional biopsies done while under local anaesthesia. Haematoxylin and eosin staining was applied to tissue samples after they had been treated using conventional histopathological methods. Among the histopathological standards for lichenoid lesions were:

• Vacuolar degeneration of the basal cell layer

• Acanthosis or atrophy of the epithelium

• Hyperkeratosis or parakeratosis

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• Band-like lymphocytic infiltration in the superficial lamina propria.

Data Collection:

Structured proforma were used to gather data, which were then entered into a Microsoft Excel spreadsheet. To reduce errors, double data entering was done. In order to preserve secrecy, patient identities were coded. Every histopathology slide and clinical photo was digitally preserved with the proper labelling.

Inter-examiner Calibration

Two examiners underwent calibration exercises on 20 patients not included in the main study. Kappa coefficient for clinical diagnosis was 0.89, indicating excellent agreement. Histopathological evaluation was performed by a single experienced oral pathologist to eliminate inter-observer variation.

Quality Control Measures

- Standardized examination protocol was followed for all patients
- Digital photography with consistent lighting and magnification
- Systematic documentation using structured data collection forms
- Regular equipment calibration and maintenance
- Blinded histopathological evaluation (pathologist was unaware of restoration details)

Statistics Investigation

Analysis of the data was done with SPSS version 25.0. We computed descriptive statistics for clinical and demographic factors. Categorical variable relationships were evaluated using the chi-square test. Statistical significance was defined as a P-value < 0.05.

Ethical Issues

With approval number KMC/IEC/2023/015, the study was authorised by Katihar Medical College & Hospital's Institutional Ethics Committee. For every participant, written informed permission was acquired.

RESULTS

Demographic Characteristics

The study comprised 60 patients diagnosed with oral lichenoid lesions. The demographic data indicated a higher prevalence among females, with 38 patients (63.3%) versus 22 males (36.7%). Ages ranged from 28 to 74 years, averaging 52.4 ± 12.8 years. The peak prevalence occurred in the 45-60 age bracket (41.7%).

Table no.1: Demographic Characteristics of Study Population (n=60)

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Variable	Category	Number (n)	Percentage (%)
Gender	Male	22	36.7
	Female	38	63.3
Age Groups	18-30 years	8	13.3
	31-45 years	17	28.3
	46-60 years	25	41.7
	>60 years	10	16.7
Occupation	Housewife	18	30.0
	Farmer	14	23.3
	Teacher	8	13.3
	Business	12	20.0
	Others	8	13.3

Mean age: 52.4 ± 12.8 years (Range: 28-74 years)

The demographic study indicated a predominance of females at 63.3%, particularly in the 46-60 age group, which accounted for 41.7%. The average age was 52.4 ± 12.8 years. Clinical assessments revealed that the buccal mucosa was the most frequently affected area, at 80%, with bilateral involvement in 56.7% of instances. The reticular pattern emerged as the most common clinical variant, observed in 58.3% of the cases.

Among restoration materials, amalgam showed the highest prevalence (70%) followed by composite restorations (46.7%). Metal-ceramic restorations demonstrated the highest contact rate with lesions (83.3%), followed by amalgam (73.8%) and composite (64.3%). Statistical analysis revealed significant associations for amalgam, composite, and metal-ceramic restorations with oral lichenoid lesions.

Histopathological examination confirmed lichenoid features in all cases, with band-like lymphocytic infiltration present universally. Dysplastic changes were observed in 13.3% of cases, with a significant association found with amalgam restorations ($p = 0.035$).

Clinical Presentation

Lesions were most commonly found in the buccal mucosa, affecting 48 patients (80%), followed by the gingiva in 24 patients (40%) and the tongue in 18 patients (30%). A bilateral presentation occurred in 34 patients (56.7%). The main clinical pattern was reticular, observed in 35 patients (58.3%), followed by erosive lesions in 15 patients (25%) and plaque-like lesions in 10 patients (16.7%).

Table no.2: Clinical Characteristics of Oral Lichenoid Lesions

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Variable	Category	Number (n)	Percentage (%)
Lesion Site	Buccal mucosa	48	80.0
	Gingiva	24	40.0
	Tongue	18	30.0
	Lips	12	20.0
	Palate	6	10.0
Laterality	Unilateral	26	43.3
	Bilateral	34	56.7
Clinical Pattern	Reticular	35	58.3
	Erosive	15	25.0
	Plaque-like	10	16.7
Symptoms	Burning sensation	45	75.0
	Pain	32	53.3
	Taste alteration	28	46.7
	Asymptomatic	12	20.0

Multiple sites and symptoms possible per patient

Restoration Material Analysis

Amalgam Restorations

Amalgam restorations were present in 42 patients (70%). Among these, 31 patients (73.8%) showed lichenoid lesions in direct anatomical contact with amalgam surfaces. The average age of amalgam restorations associated with lesions was 8.6 ± 4.2 years.

Composite Restorations

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Composite restorations were found in 28 patients (46.7%). Direct contact between composite restorations and lichenoid lesions was observed in 18 patients (64.3%). Most composite-associated lesions were located on the gingival margin.

Metal-Ceramic Restorations

Metal-ceramic crowns or bridges were present in 18 patients (30%). Notably, 15 patients (83.3%) with metal-ceramic restorations developed lichenoid lesions adjacent to these restorations, showing the highest association rate among all restoration types.

Gold Restorations

Gold restorations were found in 8 patients (13.3%), with 3 patients (37.5%) showing contact-related lesions.

Table no.3: Distribution of Dental Restoration Materials

Restoration Type	Patients with Restoration n (%)	Lesions in Contact n (%)	Contact Rate (%)	Mean Age of Restoration (years)
Amalgam	42 (70.0)	31 (73.8)	73.8	8.6 ± 4.2
Composite	28 (46.7)	18 (64.3)	64.3	4.2 ± 2.8
Metal-ceramic	18 (30.0)	15 (83.3)	83.3	6.8 ± 3.5
Gold	8 (13.3)	3 (37.5)	37.5	12.4 ± 6.2
Glass ionomer	15 (25.0)	4 (26.7)	26.7	3.1 ± 1.9

Statistical Associations

Chi-square analysis revealed significant associations between restoration materials and lesion development:

- Amalgam restorations: $\chi^2 = 12.34$, $p = 0.002$
- Metal-ceramic restorations: $\chi^2 = 18.67$, $p < 0.001$
- Composite restorations: $\chi^2 = 8.92$, $p = 0.012$

Table no.4: Statistical Analysis of Restoration Material Associations

Restoration Material	Patients with Material	Contact Lesions	Non-contact Lesions	Chi-square (χ^2)	p-value

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Amalgam	42	31	11	12.34	0.002
Composite	28	18	10	8.92	0.012
Metal-ceramic	18	15	3	18.67	<0.001
Gold	8	3	5	2.15	0.143
Glass ionomer	15	4	11	1.82	0.178

*p < 0.05 significant, *p < 0.001 highly significant

Histopathological Findings

All cases showed histopathological features consistent with lichenoid lesions. Interface mucositis with vacuolar degeneration was present in 55 cases (91.7%). Band-like lymphocytic infiltration was observed in all cases. Dysplastic changes were noted in 8 cases (13.3%), all of which were associated with amalgam restorations.

Table no. 5: Histopathological Features of Oral Lichenoid Lesions

Histopathological Feature	Number (n)	Percentage (%)
Interface mucositis	55	91.7
Vacuolar degeneration of basal cells	58	96.7
Band-like lymphocytic infiltration	60	100.0
Hyperkeratosis	48	80.0
Acanthosis	35	58.3
Epithelial atrophy	22	36.7
Dysplastic changes	8	13.3
Civatte bodies	42	70.0

Table no. 6: Relationship Between Restoration Materials and Dysplastic Changes

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Restoration Material	Total Cases	Cases with Dysplasia	Percentage (%)	p-value
Amalgam	42	8	19.0	0.035*
Metal-ceramic	18	2	11.1	0.162
Composite	28	1	3.6	0.089
Gold	8	0	0.0	-
Glass ionomer	15	0	0.0	-

$p < 0.05$ significant

Symptom Analysis

Burning sensation was the most common symptom, reported by 45 patients (75%). Pain was experienced by 32 patients (53.3%), and 28 patients (46.7%) reported taste alteration. Asymptomatic lesions were found in 12 patients (20%).

DISCUSSION

This study demonstrates a significant association between dental restoration materials and oral lichenoid lesions in the study population. The findings are consistent with previous research establishing the role of dental materials as triggers for lichenoid reactions (7, 8).

The female predominance (63.3%) observed in our study aligns with global epidemiological data showing a 2:1 female-to-male ratio for oral lichenoid conditions (9). The peak incidence in the 45-60 years age group corresponds to the period when individuals typically have multiple dental restorations, supporting the association between restoration materials and lesion development.

Material-Specific Findings

Amalgam-Associated Lesions

The high prevalence of amalgam-associated lichenoid lesions (73.8% of patients with amalgam restorations) in our study is noteworthy. Mercury, a component of dental amalgam, has been extensively studied for its potential to cause oral lichenoid reactions through both Type I and Type IV hypersensitivity mechanisms (10, 11). The average age of 8.6 years for amalgam restorations associated with lesions suggests that prolonged exposure may be necessary for the development of hypersensitivity reactions.

Metal-Ceramic Restorations

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The highest association rate was found with metal-ceramic restorations (83.3%), which can be attributed to the galvanic reactions between different metals and the release of metal ions in the oral environment (12). The base metals commonly used in these restorations, including nickel, chromium, and cobalt, are well-known contact allergens.

Composite Restorations

While composite restorations showed a lower association rate (64.3%), the relationship remains statistically significant. Composite materials can cause lichenoid reactions through the release of formaldehyde, unreacted monomers, and other chemical components (13, 14).

Clinical Implications

The high rate of direct anatomical contact between restorations and lesions (ranging from 64.3% to 83.3% depending on material type) strongly suggests a causal relationship rather than mere coincidence. This finding has important therapeutic implications, as replacement of the offending restoration material often leads to lesion resolution (15, 16).

Histopathological Considerations

The presence of dysplastic changes in 13.3% of cases, all associated with amalgam restorations, warrants careful monitoring and follow-up. While the malignant transformation potential of oral lichenoid lesions remains controversial, regular surveillance is recommended (17, 18).

CONCLUSION

The present research offers strong proof that oral lichenoid diseases and dental repair materials are related. The greatest correlation was seen between metal-ceramic restorations, amalgam, and composite materials. A causal link is supported by the high frequency of direct anatomical contact between lesions and restorations. Particularly in patients with numerous or older restorations, healthcare professionals should have a high level of clinical suspicion for lichenoid responses due to restorations. For the best results for patients, early detection and proper treatment—including taking restorative replacement into account—are essential. The results highlight the significance of choosing biocompatible dental materials and the necessity of routinely checking on patients undergoing significant restoration procedures. To develop conclusive treatment procedures, more studies with bigger sample numbers and longitudinal follow-up are necessary.

LIMITATION

One of the study's many drawbacks is its cross-sectional design, which makes it impossible to establish temporal correlations. Selection bias may be introduced by the convenience sampling approach. Furthermore, due to budget limitations, patch testing for particular metal allergies was not carried out.

FUTURE DIRECTIONS

Longitudinal studies following patients after restoration replacement would provide stronger evidence for causality. Implementation of routine

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patch testing could help identify specific allergens and guide treatment decisions. Investigation of genetic polymorphisms affecting metal metabolism may explain individual susceptibility variations.

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Conflict of Interest

The authors declare no conflicts of interest related to this study.

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