Original Article

Attitudes and Perceptions of Dental Professionals Regarding Soft Tissue Laser Use by Orthodontists: A Cross-Sectional Survey

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Abstract

Background: The use of soft tissue lasers in orthodontics has increased significantly due to their potential advantages. However, data regarding the perceptions of orthodontists and other dental professionals regarding the use of soft tissue lasers in orthodontic practice remain limited.

Objective: To evaluate the views and practices of periodontists, orthodontists, and general dentists regarding the use of soft tissue lasers by orthodontists during treatment.

Methods: A survey was conducted at the Department of Orthodontics, Saidu College of Dentistry, Swat, after obtaining ethical approval. Using convenience sampling, 207 dental professionals with valid PMDC registration participated in the study. We analyzed the data using IBM SPSS version 27. Chi-square or Fisher's exact tests and Kruskal-Wallis tests were used. A p-value of ≤0.05 was considered statistically significant.

Results: Participants were aged 30–50 years. Orthodontists made up 39.1% of respondents, periodontists 34.3%, and general dentists 26.6%. Most participants believed it was appropriate for orthodontists to perform soft tissue laser procedures; however, periodontists showed significantly less support than orthodontists and general dentists ($p<0.001$). Orthodontists and general dentists were more inclined to think that the use of lasers increased referrals to orthodontic practices, while most periodontists saw no impact on referrals ($p<0.001$). There were notable differences between specialties regarding orthodontists performing various laser-assisted procedures, particularly gingivectomy and operculectomy ($p<0.001$). Despite positive attitudes, the regular use of soft tissue lasers in clinical practice remained limited.

Conclusion: Most dental professionals supported the use of soft tissue lasers by orthodontists during treatment, although periodontists were less supportive. Reported clinical use of soft tissue lasers in orthodontics remained limited.

Keywords: Orthodontic, Laser Therapy, Gingivectomy, Attitude of Health Personnel

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Introduction

The term "LASER," an acronym for Light Amplification by Stimulated Emission of Radiation, refers to a highly focused, coherent, and monochromatic beam of light.[1] Lasers have emerged as a valuable adjuvant therapy in dentistry offering a precise management of both hard and soft tissues with the targeted wavelength- tissue interactions playing a significant role in enhancing patient satisfaction and clinical outcomes.[2] Laser was first introduced in the 1970s with the application of CO_2 lasers for soft tissue procedures in oral surgery, since then laser technology has advanced extensively. Over time, various systems including diode, Nd:YAG, Er:YAG, argon, and erbium lasers have been introduced into the multiple dental disciplines, such as periodontics, implantology, orthodontics, and restorative dentistry, establishing their role as an essential component of contemporary practice.[3,4] In recent years, diode lasers have gained increasing popularity in orthodontic practice, offering reliable solutions for soft tissue management and esthetic enhancement. The attraction is mainly due to its cost-effectiveness, ease of use, and the regular favorable feedback reported by both specialists and patients.[5] One of the most important quality of Diode lasers is that they offer high precision by selectively targeting soft tissues while mitigating the risk of damage to adjacent teeth and bone.[6] The clinical advantages of these lasers constitute of arrest of hemorrhage, minimizing the risk of infection, and improved esthetic outcomes have been well documented in the literature, which leads to enhanced treatment efficiency and patient satisfaction.[7] Diode lasers have an increased utilization in orthodontics as they perform a variety of soft tissue procedures, such

as gingival contouring, exposure of erupting teeth, frenectomy, gingivectomy, and gingivoplasty.[8,9] Lasers are also being used for operculectomies, removal of hyperplastic tissue associated with poor oral hygiene or space closure, exposure of temporary anchorage devices, and management of oral lesions including aphthous ulcers and recurrent herpetic outbreaks.[10]

Most specialists consider the usage of soft-tissue lasers during orthodontic treatment by orthodontists appropriate (84%), but periodontists agreement on this is far less than the general dentists and orthodontists($p< 0.001$).[11] The use of soft-tissue lasers in practice remains variable: early studies showed less acceptance (≈3–4%), while the recent literature reports higher use (up to ~28% in some cohorts), indicating an increasing but still limited application in routine procedures. Major concerns regarding the cost, inadequate training considering the sensitivity of the procedure persists and many experts advise for the laser training to be incorporated into dental education.[12] The current studies and advancements in technology of lasers have led to the increased incorporation of diode lasers in orthodontics and has enabled the orthodontists to carry out soft tissue procedures which were once limited to other dental specialties. These diode lasers offer a vast variety of benefits to patients including excellent hemostasis, decreased postoperative pain, rapid healing, being precise and minimally invasive. Hence, the aim of this study was to analyze and interpret the perceptions of dental specialists concerning the use of soft tissue lasers by orthodontists during orthodontic treatment, with the goal of setting a standard guideline which strengthens and amplifies the clinical outcomes and patient satisfaction.

Methods

After obtaining the ethical approval from the ethical board (No. 136-ERB/ SMC/STMC/ 025), this study was conducted at the Department of Orthodontics, Saidu College of Dentistry, Swat over a duration of three months. A non-probability convenience sampling technique was employed, and a sample size of 207 was calculated using OpenEpi at a 5% margin of error, 95% confidence interval, and an expected proportion of 84%, based on findings from a previous study. This study's inclusion criteria were composed of dental specialists (periodontists, orthodontists, and general dentists) with a valid PMDC registration across the province of Khyber Pakhtunkhwa. All orthodontists with relevant qualifications were included in this study. Exclusion criteria comprised of dentists without a valid PMDC registration, retired or non-practicing specialists, students, interns, house officers, trainee medical officers and those were unable to submit a complete questionnaire. Informed consent was obtained from all the participants electronically at the beginning of the Google Forms questionnaire. A structured digital questionnaire was used to collect data and was developed using Google Forms. The questionnaire was adapted from a previous study which was based upon the usage of soft tissue lasers in orthodontics. Faculty members of Departments of Orthodontics, Periodontics and General Dentistry were asked to review this adapted questionnaire and critically analyze it for its clarity, applicability, interpretability and relevance. It also went under two stages of pre-testing to ascertain the obscurities and evaluate its ease of completion and comprehensibility. Based on the feedback from the faculty members, all the revisions advised were completed before its final distribution to the participants. The questionnaire was divided into three sections for the ease of understanding: Annexure 1 comprised of the demographic characteristics, Annexure 2 constituted of soft tissue lasers usage by orthodontists, and Annexure 3 was based on laser expertise. Different aspects were addressed in this questionnaire includeing the necessary demographics, clinical use of laser, expertise, frequency of usage, cost, procedures perfformed, and the perceptions of professionals. These items were not designed to constitute a single unidimensional psychometric scale. The expert review and pre-testing were used to assess face and content validity and to improve the clarity and usability of the questionnaire. The finalized questionnaire was distributed through social media platforms to maximize reach. Reminders were sent to non-responders two weeks after the initial distribution and again one month later. The response denominators used for the practice-related questions were derived from the total number of respondents in each group of professionals: 81 orthodontists, 71 periodontists and 55 general dentists. For those questions in which multiple responses were possible, every response was analyzed separately, hence the percenttages were not expected to be total 100%.

Data Analysis

The collected data were entered in IBM SPSS Statistics version 27 to carry out statistical analysis. Counts and proportions were computed for categorical variables. Numerical variables were summarized as mean ± standard deviation when found normally distributed. Non-normal numerical variables were expressed as median with interquartile range. Assumption of normality was tested with the Shapiro-Wilk test. Categorical variables related to attitude and practices were compared among different dental professionals using Chi-square or Fisher's exact test as appropriate. Numerical ratings of attitude were compared among different dental professionals with the Kruskal-Wallis test. Post-hoc comparisons were made using Mann–Whitney U test with Bonferroni correction. A two-tailed p-value at a threshold of ≤0.05 was deemed statistically significant.

Results

Altogether 207 complete responses were received and analyzed. The participants had an age range of 30–50 years. Most participants (72.5%) were aged 30–40 years, while 27.5% were aged 40–50 years. Around half of survey participants were males (52.2%). Periodontists constituted 34.3% of the participants. Approximately one-quarter of the participants were general dentists. Almost two-thirds of participants had <5 years of experience (65.7%). Overall, 39.6% of participants had not undertaken any formal continuing education related to soft tissue lasers during the previous five years. Table 1 outlines an overview of sociodemographic features of study participants.

Table 1: *Sociodemographic and professional characteristics of study participants (N=207)*

Variables	Groups	Frequency	Percentage
Age (years)	30-40 years	150	72.5
	40-50 years	57	27.5
Gender	Male	108	52.2
	Female	99	47.8
Professional Group	General Dentists	55	26.6
	Orthodontists	81	39.1
	Periodontists	71	34.3
Professional experience	Less than 5 years	136	65.7
	More than 5 years	71	34.3
Laser-related continuing education in previous 5 years	0 hours	82	39.6
	1-8 hours	64	30.9
	9-16 hours	29	14.0
	17-24 hours	18	8.7
	>24 hours	14	6.8

Note: Values are presented as n (%).

Attitude of dental professionals

The majority of dental professionals considered it appropriate for orthodontists to perform soft tissue procedures. However, the proportion of periodontists supporting this practice was significantly lower than that of orthodontists and general dentists (p<0.001). More than half of the general dentists and orthodontists had the opinion that the use of a soft tissue laser by orthodontists increases referrals to the orthodontist's practice, whereas more than half of the periodontists believed it had no effect (p<0.001).

Table 2: *Attitudes of dental professionals toward soft tissue laser procedures performed by orthodontists*

Variables	Response	Periodontists, n(%)	Orthodontists, n(%)	General Dentists, n(%)	p-value
Appropriateness of orthodontists performing soft tissue procedures	Yes	34(47.9)	67(82.7)	43(78.2)	*p<0.001
	No	37(52.1)	14(17.3)	12(21.8)	
Effect of soft tissue laser use on orthodontic referrals	Increases referrals	22(31)	47(58)	35(63.6)	*p<0.001
	Decreases referrals	11(15.5)	8(9.9)	2(3.6)	
	No effect	38(53.5)	26(32.1)	18(32.7)	

*Chi-square/Fisher's exact test; statistically significant at p<0.05.

Table 3 outlines a comparison of ratings on the dental professionals' views regarding orthodontists performing different soft tissue laser procedures. Ratings differed significantly among the three professional groups for most of the evaluated soft tissue laser procedures, except for mini-screw/TAD uncovering

(procedure D) and aphthous-ulcer ablation (procedure G). Post-hoc comparisons showed no significant difference between general dentists and orthodontists for localized gingivectomy (procedure A). For generalized anterior gingivectomy (procedure B) and gingivectomy for crown lengthening (procedure E), no significant differences were observed between orthodontists and periodontists. For operculectomy (procedure C), ratings differed significantly among all three professional groups. For laser-assisted midline diastema closure (procedure F), the median ratings of general dentists and orthodontists were similar.

Table 3: *Comparison of ratings regarding the appropriateness of orthodontists performing specific soft tissue laser procedures*

Soft tissue Laser Procedure	Periodontists	Orthodontists	General Dentists	p-value
A. Localized gingivectomy	3(1-4)	1(1-2)	1(1-2)	<0.001
B. Generalized anterior gingivectomy	2(1-5)	2(1-2)	1(1-2)	<0.001
C. Operculectomy for third molars	3 (1-3)	2(1-3)	1(1-2)	<0.001
D. Uncovering mini-screws/TADs	2(1-3)	2(1-3)	2(1-3)	0.569
E. Gingivectomy for crown lengthening	2(1-4)	2(1-3)	1(1-2)	<0.001
F. Laser-assisted midline diastema closure	3(2-4)	2(1-3)	2(1-3)	<0.001
G. Ablation of aphthous ulcers	2(1-3)	3(1-3.5)	2(1-3)	0.590

*Values are presented as median (IQR). A five-point scale was used to record how appropriate it was for an orthodontist to perform each procedure, with 1 indicating most appropriate and 5 indicating very inappropriate for the orthodontist to perform the procedure. Kruskal–Wallis test; statistically significant at p<0.05.

Table 4 summarizes the practice of dental professionals regarding use of soft tissue laser in their practice. None of the assessed practice-related parameters differed significantly among the three professional groups.

Table 4: *Clinical use of soft tissue lasers among dental professionals*

Variables	Groups	Periodontist	Orthodontist	General Dentist	p-value
Currently use a soft tissue laser	yes	25(35.2)	18(22.2)	12(21.8)	0.126
	no	46(64.8)	63(77.8)	43(78.2)	
Perform laser procedures themselves	yes	46(64.8)	40(49.4)	33(60)	0.145
	no	25(35.2)	41(50.6)	22(40)	
Have a visiting laser expert	yes	21(29.6)	24(29.6)	14(25.5)	0.843
	no	50(70.4)	57(70.4)	41(74.5)	
Perform adjunctive to orthodontic treatment procedures with a soft tissue laser	Localized Gingivectomy	23(32.4)	25(30.9)	24(43.6)	ϕ
	Generalized anterior Gingivectomy	12(16.9)	29(35.8)	9(16.4)	
	Operculectomy for 3rd molars	2(2.8)	3(3.7)	2(3.6)	
	Uncovering mini-screws/TADs	9(12.7)	4(4.9)	4(7.3)	
	Gingivectomy for crown lengthening	3(4.2)	5(6.2)	7(12.7)	
	Laser-assisted midline diastema closure	12(16.9)	6(7.4)	2(3.6)	
	Ablation of aphthous ulcers	2(2.8)	0(0)	0(0)	
	others	8(11.3)	9(11.1)	7(12.7)	
Frequency of laser use	daily	8(11.3)	7(8.6)	6(10.9)	0.905
	weekly	10(14.1)	12(14.8)	10(18.2)	
	Less than once a month	42(59.2)	53(65.4)	30(54.5)	
	monthly	11(15.5)	9(11.1)	9(16.4)	
Charge a fee for laser procedures	yes	43(60.6)	43(53.1)	23(41.8)	0.160
	sometimes	10(14.1)	18(22.2)	10(18.2)	
	no	18(25.4)	20(24.7)	22(40)	

Data are reported as n (%), with response denominator derived from the total number of respondents in each professional group (Orthodontists n= 81, Periodontists n= 71 and General dentists n=55). For the laser-assisted procedures item, multiple responses were permitted; therefore, percentages may not total 100%. p-value was not calculated because of low expected cell counts.

Figure 1 depicts the distribution of training encouraging participants to incorporate the soft tissue laser into their practice. No significant differences emerged in the frequency of training distribution among different dental professionals.

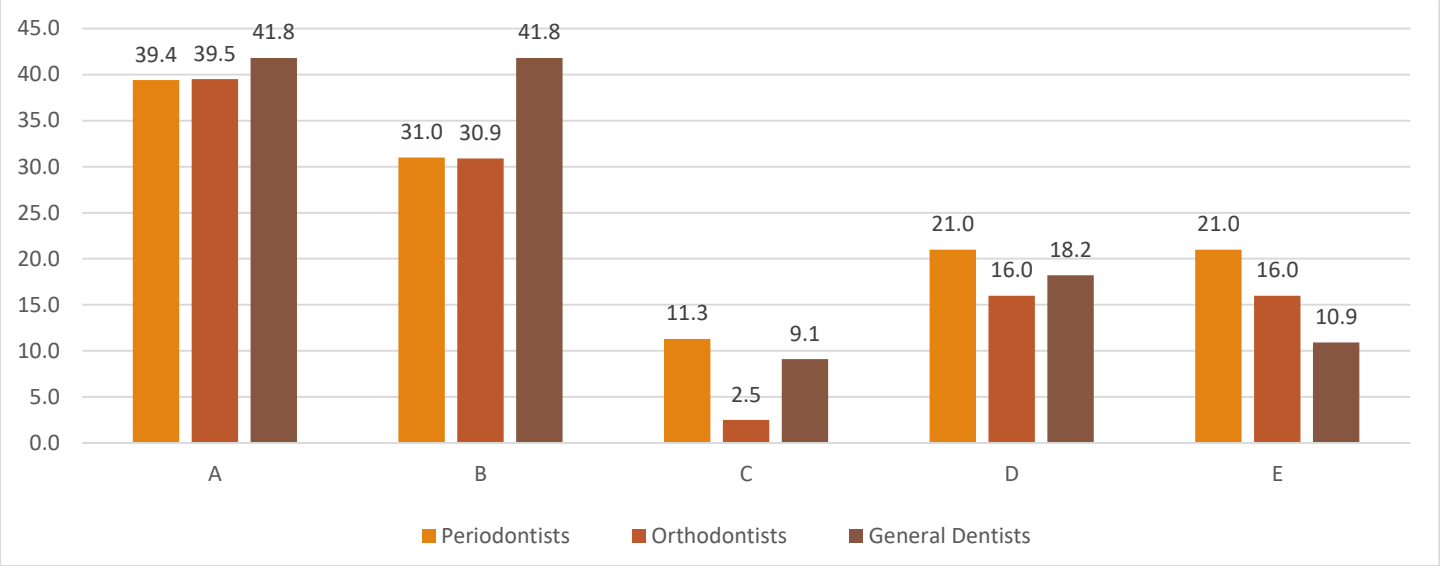


Figure 1. *Types of training reported by dental professionals for incorporation of soft tissue lasers into clinical practice.*
A: Workshop in laser program with CME, B: Formal advanced training/advanced course in soft tissue laser program, C: Company-sponsored certification course, D: Self-directed learning/YouTube, E: Others

Discussion

The study evaluated the attitudes and practices of periodontists, orthodontists, and general dentists regarding the use of soft tissue lasers by orthodontists during orthodontic treatment. The expanding laser use in dentistry makes it necessary to understand and evaluate the views and beliefs of different dental specialists as to advance and stimulate inter-disciplinary coordination, identify the professionals' boundaries and enhance patient satisfaction at the end of treatment. Participants of variable age, different specialties and professional experience were enrolled in this study. The results mainly constituted of the positive perception of dental professionals regarding the use of soft tissue lasers by orthodontists which reflects an overall increasing acceptability of lasers employment in orthodontics. However, periodontists demonstrated significantly lower acceptance compared with orthodontists and general dentists. The authors of the previous study suggested that periodontists may have felt that the use of soft tissue lasers should be limited to specialists because they are trained in laser use and are better aware of the possible clinical and biological consequences.[12] Similar inter-specialty differences have been reported previously, where periodontists expressed greater reservations about orthodontists independently performing laser-assisted soft tissue procedures.[10] Gupta et al. reported that approximately 84% of surveyed clinicians supported orthodontists performing laser-assisted soft tissue procedures.[11] The study also highlighted that orthodontists and general dentists were more likely to believe that the use of soft tissue lasers increases referrals to orthodontic practices, whereas most periodontists perceived no effect on referral patterns. Variations in opinions may reflect differences in clinical exposure,

case management, and the referral practices among the specialties. However, as this survey analyzed the perceptions of specialists rather than actual referral patterns, these outcomes should not be interpreted as evidence that soft tissue laser use directly influences referrals. A significant difference was observed in the attitudes and perceptions toward specific laser-assisted procedures among the different specialties. Procedures performed by orthodontists such as gingivectomy for esthetics or hygiene improvement were less favorably rated by the periodontists than orthodontists and general dentists. For extensive procedures such as gingivectomy and crown lengthening, the patient's current gingival and periodontal condition and relevant anatomy should be thoroughly evaluated, followed by a referral to a periodontist when considered necessary.

Despite these differences, the scores among the professional groups were similar for procedures such as mini-screw exposure and the management of aphthous ulcers.[3,16] Despite generally favorable attitudes, actual use of soft tissue lasers in clinical practice remained limited, with less than one-third of participants reporting routine laser use. This is also supported by studies conducted in past which stated that despite the rapidly increasing advantages of laser technology, the overall adoption of this laser in practice remains modest.[12] Several hindrances may have played a role in these altered attitudes and utilization of lasers in practice including the lasers being costly, the technical sensitivity of the procedure and limited training to dentists. Another important issue highlighted in this study was the lack of continued formal education and training (in the last 5 years) reported by the participants which emphasizes the need for continuous training and educational opportunities for specialists across the whole country. However, clinical competence does not only depend upon exposure to laser training, but it also requires appropriate practical skills, necessary knowledge, careful case selection, and direct supervision. Hence this wide gap between different specialties, the concerns of periodontists and safe usage of laser technology may be addressed by the laser education being included in the dentistry programs permanently.

The study also had some limitations including the use of convenience sampling and self-reported data hence limiting the generalizability of this study. In addition, this study also analyzed the self-reported clinical practices and exposures to laser training rather than measuring clinical competence objectively. Overall findings recommend multiple future studies with probability sampling and longitudinal designs to evaluate how training, experience, and evolving technology influences the patient outcome, patient satisfaction and the perceptions of other specialties.

Conclusion

This study demonstrates that most of the orthodontists and general dentists supported the use of soft tissue lasers by orthodontists during orthodontic treatment while the periodontists proved to be less supportive regarding this use. Reported clinical use of the soft tissue lasers remained limited. The findings of this study indicate differences in perceptions among the professional groups and the importance of further longitudinal studies for further advancements in this field and to form concrete clinical guidelines regarding laser use.

Ethical Approval: The Ethical Review Board, Said Medical College, Swat approved this study vide letter No. 136-ERB/ SMC/STMC/ 025.

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Authors' Contribution:

SR: Conception and design, drafting of article, critical revisions for important intellectual content, final approval of the version to be published

TM: Acquisition of data, analysis and interpretation of data

HG: Conception and design, drafting of article

HUR: Analysis and interpretation of data

AH: Acquisition of data, Analysis and interpretation of data

SHB: Final approval of the version to be published

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