

Use of Lasers in Oral Maxillofacial Surgery; a cross-sectional study done in Riyadh, Saudi Arabia

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Abstract

This cross-sectional survey was aimed to assess the use of Lasers in oral maxillofacial surgery. The study subjects comprised of general dentists and specialists/consultants having experience of 1-10 years, and more than 10 years. The use of Lasers in oral maxillofacial surgery was measured using 24 items questionnaire. After ensuring the reliability of the questionnaire, differences across gender, clinical position, and clinical experience were seen using a statistical measure Chi-square through SPSS to determine the statistically significant differences ($p < 0.05$). Findings 52.7% of the participants were female, and 89.7% were general dentists, with the majority having experience between 1-10 years. They rank their current knowledge regarding laser use overall as average (36.3%) and about its use in OMFS as good (37.3%). Findings revealed that female participants participated more than males and practicing as general dentists having experience of 1-10 years of experience, have good knowledge of laser, and use it in their practice. General dentists were only aware of the use of laser in cosmetic surgery and consider it useful in different problems. Both groups often use lasers in their practice, while about the usefulness of lasers in different problems, both groups' opinions vary.

Keywords: Lasers, Maxillofacial surgery, Cross-sectional, Riyadh

INTRODUCTION

As the first reported use of lasers dedicated to Oral and Maxillofacial surgery, Strong *et al.* may have utilized CO₂ lasers to excision premalignant and malignant tumors, among other surgical procedures. Kaplan *et al.* used lasers to treat oral tumors in 1974 [1, 2].

When a laser is used instead of a scalpel, there is less bleeding. This creates a largely bloodless battlefield. Because of its heat effects, the laser also coagulates the surrounding region [3]. Hemostasis is performed using lasers by contracting the collagen of the vascular wall of arteries with diameters of up to 500 m. The vessel diameter is reduced as a result, and the bleeding is managed. This feature substantially simplifies the treatment of vascular defects as well as hemorrhage management [4].

Lasers can be used to perform all medical treatments that aid in prosthesis recovery [5].

According to several writers, the benefits of lasers over other traditional dental equipment include increased coagulation, resulting in a drier operative field for improved visibility. When there is tissue ingestion and directed warmth develops, this interaction occurs [6].

Literature Review

An audit article states about the laser utilized in the oral treatment that these days, the use of laser involves the standard utilization of different medicines and dental hardware. The headway of innovation and information on numerous applications in regular practice will build the utilization of laser and our consciousness of the wide scope of benefits related with a medical procedure and mending. "The clinical utilization of the laser is captivating for two reasons," said Dr. Theodore Maiman, the maker of the main laser. From one perspective, it is a confident mission, while on the other, it repudiates the underlying picture of the laser

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is a passing beam" [6].

Another review study on the application of laser in oral surgeries in 2020 by Karishna, R.N., states that laser dentistry is fascinating; good scientific principles require that novel laser applications for treating patients be explored with prudence and reasonable judgment. Specific laser technologies are likely to become a key part of modern oral and maxillofacial professional procedures in the coming time.

MATERIALS AND METHODS

Study Design

This is a cross-sectional study conducted among Saudi dental professionals using an online survey.

Study Sample

311 dentists from Riyadh city were utilized in this study.

Study Instrument

The online questionnaire consists of questions related to demographic data followed by questions including knowledge and attitude towards the lasers in general, then related to their use in oral and maxillofacial surgery. The questionnaire consisted of closed-ended questions. Consent was taken from the participants before beginning with answering the questions. Google forms were utilized as a mode of questionnaire building and distributing. Data were kept confidential and stored until their use.

Instrument Validity and Reliability

A pilot study was conducted by sending the survey to 20 participants. The data were inserted in SPSS version 22 to determine the **reliability** using Chronbach's coefficient alpha (value: 0.781). The **validity** of the questionnaire was tested by sending it to experienced researchers in PSMC, and changes were made according to their feedback and comments.

Statistical Analysis

Collected data were analyzed using SPSS version 22, where descriptive as well as inferential statistics were conducted. Comparisons between groups were made with the value of significance kept under 0.05 using the Chi-square test.

RESULTS AND DISCUSSION

In **Table 1**, frequency analysis, 52.7% of the participants were female, and 89.7% were general dentists, with the majority having experience between 1-10 years. In **Table 2**, both male and female participants were mostly general dentists, and more females with 10 years working experience compared to male dentists.

Male participants' perception about the use of lasers in different kinds of problems varies between somewhat true and true. However, for female participants, it mostly lies on do not know. **Tables 3 and 4** shows the differences across experience and qualification.

Table 1. Frequencies of responses

Questions	Frequency	Percent
Gender	Male	147
	Female	164
Qualification	General dentist	279
	Specialist/consultant	32
Work experience	1-10 years	183
	10+ years	128
How do you rate your current level of knowledge regarding lasers overall?	Poor	101
	Average	113
	Good	97
How do you rate your current level of knowledge regarding lasers used in OMFS?	Poor	102
	Average	93
	Good	116
When were the lasers invented?	The 1910s	69
	1930s	51
	1950s	32
	Don't Know	159
How often do you use lasers in your practice?	Never	120
	Often	184
	Sometimes	7

	Not useful	22	7.1%	
	Somewhat useful	105	33.8%	
Can lasers be useful in performing biopsy procedures?	Very useful	76	24.4%	
	Don't know	108	34.7%	
	Not useful	39	12.5%	
Can lasers be useful for surgical extraction procedures?	Somewhat useful	65	20.9%	
	Very useful	84	27.0%	
	Don't know	123	39.5%	
	Not useful	4	1.3%	
Can lasers be useful for Pre-prosthetic surgery?	Somewhat useful	87	28.0%	
	Very useful	108	34.7%	
	Don't know	112	36.0%	
	Not useful	13	4.2%	
Can lasers be useful for implantology?	Somewhat useful	102	32.8%	
	Very useful	56	18.0%	
	Don't know	140	45.0%	
	Not useful	1	.3%	
Can lasers be useful for cosmetic surgery?	Somewhat useful	87	28.0%	
	Very useful	127	40.8%	
	Don't know	96	30.9%	
	Not true	21	6.8%	
Your perception about 'lasers effectively coagulate blood vessels in the field of operatory'?	Somewhat true	122	39.2%	
	Very true	62	19.9%	
	Don't know	106	34.1%	
	Not true	17	5.5%	
Your perception about 'lasers provides a reduced need for sutures'?	Somewhat true	74	23.8%	
	Very true	116	37.3%	
	Don't know	104	33.4%	
	Not true	31	10.0%	
Your perception about 'lasers causing increased pain 4-7 days postoperatively'?	Somewhat true	72	23.2%	
	Very true	71	22.8%	
	Don't know	137	44.1%	
	Not true		3.5%	
Your perception about 'lasers causing health hazard if beams are scattered or reflected'?	Somewhat true	11	30.9%	
	Very true	96	27.7%	
	Don't know	86	37.9%	
	Don't know	118	40.2%	
	Argon		34.7%	
Which laser is indicated for pigmented lesions, vascular anomalies, plastic surgery?	Argon	108		
	Diode	75	24.1%	
	Nd: YAG, Ho: YAG	101	32.5%	
	Er, Cr: YSGG, ER: YAG	27	8.7%	
	Argon	76	24.4%	
Which laser is indicated for soft tissue procedures?	Diode	118	37.9%	
	Nd: YAG, Ho: YAG	103	33.1%	
	Er, Cr: YSGG, ER: YAG	14	4.5%	
	Argon		4.2%	
Which laser is indicated for hard tissue procedures?	Diode	13		
	Nd: YAG, Ho: YAG	87	28.0%	
	Nd: YAG, Ho: YAG	106	34.1%	
	Er, Cr: YSGG, ER: YAG	105	33.8%	
Do you think you require more knowledge about lasers in oral maxillofacial surgery procedures?	Yes	161	51.8%	51.8
	No	12	3.9%	
	May be	138	44.4%	55.6

Table 2. Comparison across Gender

Questions		Male	Female	P value
Qualification	General dentist	137	142	.04
	Specialist/consultant	10	22	
Work experience	1-10 years	106	77	.000
	10+ years	41	87	
How do you rate your current level of knowledge regarding lasers overall?	Poor	59	42	.000
	Average	71	42	
	Good	17	80	
		147	164	
How do you rate your current level of knowledge regarding lasers used in OMFS?	Poor	59	43	.000
	Average	69	24	
	Good	19	97	
	Never	112	8	
How often do you use lasers in your practice?	Often	32	152	.000
	Sometimes	3	4	
Can lasers be useful in performing biopsy procedures?	Not useful	10	12	.001
	Somewhat useful	51	54	
	Very useful	49	27	
	Don't know	37	71	
Can lasers be useful for surgical extraction procedures?	Not useful	12	27	.000
	Somewhat useful	40	25	
	Very useful	61	23	
	Don't know	34	89	
Can lasers be useful for pre-prosthetic surgery?	Not useful	2	2	.033
	Somewhat useful	41	46	
	Very useful	62	46	
	Don't know	42	70	
Can lasers be useful for implantology?	Not useful	12	1	.000
	Somewhat useful	50	52	
	Very useful	33	23	
	Don't know	52	88	
Can lasers be useful for cosmetic surgery?	Not useful	1	0	.000
	Somewhat useful	52	35	
	Very useful	67	60	
	Don't know	27	69	
Your perception about 'lasers providing better healing as compared to scalpel wounds'?	Not true	4	3	.028
	Somewhat true	49	31	
	Very true	42	59	
	Don't know	52	71	
Your perception about 'lasers provides a reduced need for sutures'?	Not true	8	9	.000
	Somewhat true	51	23	
	Very true	55	61	
	Don't know	33	71	
Your perception about 'lasers causing increased pain 4-7 days postoperatively'?	Not true	23	8	.000
	Somewhat true	43	29	
	Very true	32	39	
	Don't know	49	88	
Your perception about 'lasers being very expensive and need training'?	Not true	1	1	.000
	Somewhat true	44	34	
	Very true	71	35	
	Don't know	31	94	
Which laser is indicated for soft tissue procedures?	Argon	55	21	.000
	Diode	64	54	
	Nd:YAG, Ho: YAG	16	87	
	Er, Cr: YSGG, ER: YAG	12	2	
Which laser is indicated for hard-tissue procedures?	Argon	12	1	.000
	Diode	47	40	
	Nd:YAG, Ho: YAG	70	36	
	Er, Cr: YSGG, ER: YAG	18	87	
Do you think you require more knowledge about lasers in oral	Yes	84	77	.099

maxillofacial surgery procedures?

No
May be

7
56

5
82

Table 3. Comparison across Qualification

Questions		Qualification		P-value
		General dentist	Specialist/ consultant	
Gender	Male	137	10	.055
	Female	142	22	
Work experience	1-10 years	161	22	.156
	10+ years	118	10	
How do you rate your current level of knowledge regarding lasers overall?	Poor	98	3	.013
	Average	97	16	
	Good	84	13	
	1910s	59	10	
When were the lasers invented?	1930s	44	7	.010
	1950s	25	7	
	Don't Know	151	8	
How often do you use lasers in your Practice?	Never	113	7	.048
	Often	161	23	
	Sometimes	5	2	
	Not useful	3	19	
Can lasers be useful in performing biopsy procedures?	Somewhat useful	95	10	.000
	Very useful	74	2	
	Don't know	107	1	
	Not useful	31	8	
Can lasers be useful for surgical Extraction procedures?	Somewhat useful	63	2	.000
	Very useful	63	21	
	Don't know	122	1	
	Not useful	7	0	
Can lasers be useful for apicoectomy procedure?	Somewhat useful	70	10	.000
	Very useful	67	18	
	Don't know	135	4	
	Not useful	12	1	
Can lasers be useful for implantology?	Somewhat useful	90	12	.000
	Very useful	37	19	
	Don't know	140	0	
	Not useful	1	0	
Can lasers be useful for cosmetic surgery?	Somewhat useful	72	15	.001
	Very useful	110	17	
	Don't know	96	0	
	Not true	18	0	
Your perception about 'Lasers incise tissue more efficiently than a scalpel'	Somewhat true	83	23	.000
	Very true	78	9	
	Don't know	100	0	
	Not true	1	0	
Your perception about 'histologically, wound shows less wound contracture and scarring'?	Somewhat true	59	7	.071
	Very true	73	15	
	Don't know	146	10	
	Not true	8	9	
Your perception about 'lasers provides reduced need for sutures'?	Somewhat true	65	9	.000
	Very true	103	13	
	Don't know	103	1	
	Not true	48	19	
Your perception about 'lasers causing delayed healing'?	Somewhat true	92	1	.000
	Very true	10	4	
	Don't know	129	8	
Your perception about 'lasers causing health hazard if beams are scattered or reflected'?	Not true	10	1	.000
	Somewhat true	88	8	

	Very true	65	21	
	Don't know	116	2	
	Argon	95	13	
Which laser is indicated for pigmented lesions, vascular anomalies, and plastic surgery?	Diode	69	6	.000
	Nd:YAG, Ho: YAG	98	3	
	Er, Cr: YSGG, ER: YAG	17	10	
	Argon	13	0	
Which laser is indicated for hard tissue procedures?	Diode	60	27	.000
	Nd:YAG, Ho: YAG	102	4	
	Er, Cr: YSGG, ER: YAG	104	1	
	Yes	151	10	
Do you think you require more knowledge about lasers in oral maxillofacial surgery procedures?	No	11	1	.037
	May be	117	21	

Table 4. Comparison across clinical Experience

Questions		Experience		P value
		1-10 years	10+ years	
Gender	Male	106	41	.000
	Female	77	87	
How do you rate your current level of knowledge regarding lasers overall?	Poor	66	35	
	Average	103	10	.000
	Good	14	83	
	1910s	35	34	
When were the lasers invented?	1930s	43	8	.000
	1950s	30	2	
	Don't Know	75	84	
How often do you use lasers in your Practice?	Never	81	39	
	Often	97	87	.000
	Sometimes	5	2	
	Not useful	12	07	
Can lasers be useful for vaporization and ablation procedures?	Somewhat useful	55	20	.000
	Very useful	66	17	
	Don't know	50	84	
	Not useful	36	03	
Can lasers be useful for surgical Extraction procedures?	Somewhat useful	49	16	.000
	Very useful	74	10	
	Don't know	24	99	
	Not useful	02	02	
Can lasers be useful for pre-prosthetic surgery?	Somewhat useful	68	19	.000
	Very useful	83	25	
	Don't know	30	82	
	Not useful	12	01	
Can lasers be useful for implantology?	Somewhat useful	64	38	.000
	Very useful	49	07	
	Don't know	58	82	
	Not true	16	02	
	Somewhat true	87	19	
Your perception about 'Lasers incise tissue more efficiently than a scalpel'	Very true	62	25	.000
	Don't know	18	82	
	Not true	00	01	
.Your perception about 'histologically, wound shows less wound contracture and scarring'?	Somewhat true	42	24	.000
	Very true	70	18	
	Don't know	71	85	
	Not true	59	08	
Your perception about 'lasers causing delayed healing'?	Somewhat true	58	35	.000
	Very true	12	02	
	Don't know	54	83	
	Not true	10	01	
Your perception about 'lasers causing health hazard if beams are scattered or reflected'?	Somewhat true	75	21	.000
	Very true	62	24	

	Don't know	36	82	
	Argon	69	39	
Which laser is indicated for pigmented lesions, vascular anomalies, and plastic surgery?	Diode	73	02	
	Nd:YAG, Ho: YAG	15	86	.000
	Er, Cr: YSGG, ER: YAG	26	01	
	Argon	67	09	
Which laser is indicated for soft tissue procedures?	Diode	85	33	
	Nd:YAG, Ho: YAG	19	84	.000
	Er, Cr: YSGG, ER: YAG	12	02	
Do you think you require more knowledge about lasers in oral maxillofacial surgery procedures?	Yes	140	21	
	No	07	05	.000
	May be	36	102	

The present study was aimed to check the use of LASER in maxillofacial surgery. To analyze, non-parametric measure Chi-square was applied through SPSS. In frequency analysis, 52.7% of the participants were female, and 89.7% were general dentists, with the majority having experience between 1-10 years. They rank their current knowledge regarding laser use overall as average (36.3%) and about its use in OMFS as good (37.3%). 50.2% are not aware of laser's effectiveness in healing compared to scalpel wounds, and 37.3% said it is true that laser provides the need for sutures. 29% think laser's delayed healing is somewhat true, the majority do not know about that increased pain caused by the laser, and laser being expensive and need training. 34.7% consider Argon for pigmented lesions, vascular anomalies, and literature also reports it as a good choice for pigmented lesions [7], 37.9% consider Nd: YAG, Ho: YAG for soft tissue procedures, 34.1% consider it for hard tissues and 51.8% think they need more knowledge about laser in oral maxillofacial surgery procedures.

In the next analysis, gender differences were examined, finding reported significant differences. Both male and female participants were mostly general dentists, and more females have working experience of more than 10 years compared to male dentists. Females marked their knowledge good about laser as compared to males and its use in OMFS. The majority of both genders were not aware of when the laser was invented. Female dentists more often use lasers in their practice as compared to male dentists. Literature also tells that mostly male dentists are aware of different edge points of laser in dentistry. Almost 94.3% of participants know that [8]. Female participants think YAG, Ho: YAG for pigmented lesions. In contrast, male participants think Diode for this but literature reports Argon as a good choice for pigmented lesions, as mentioned in the above paragraph. For soft tissues, females consider YAG again while males consider Diode, and a review article also reports Diode as a good choice for soft tissues [6].

In subsequent analysis, comparison across education was carried out. General dentists have more experience than specialists, and they rate their knowledge about laser overall and its use in OMFS as good. General dentists were more aware of the laser's invention than specialist dentists and more often used laser in their practice. Specialists consider

Argon for pigmented lesions while general dentists consider YAG for this; literature also reports Argon as a good choice for pigmented lesions. For soft tissues, specialists preferred Argon, while general dentists preferred Diode as reported by literature too [6].

In subsequent analysis, differences across clinical experience were tested. Females have greater experience as compared to males. Participants having experience of more than 10 years have good knowledge of laser and its use in OMFS, while those with experience of fewer than 10 years have average knowledge about it. Both groups often use lasers in their practice, while about the usefulness of lasers in different problems, both groups' opinions vary. At the same time, those with less than 10 years of experience agreed, and literature also reports that freshly graduated or those having less experience show interest in learning more about laser, and 69% are interested in getting training about this [8]. A few quantitative studies have been conducted on evaluating dentists' knowledge about laser and its uses, and the present research is a great addition to the existing body of knowledge about the current topic.

CONCLUSION

Findings revealed significant differences across gender, qualification, and clinical experience. Female participants participated more than males and practicing as general dentists having experience of 1-10 years of experience, have good knowledge of laser, and use it in their practice. General dentists were only aware of the use of laser in cosmetic surgery and consider it useful in different problems.

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