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Original Research Article

Use of orthodontic mini-screws among orthodontists in Saudi Arabia

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ABSTRACT

Background: Orthodontic anchorage is a technique used to avoid undesired tooth movement. The miniature screw (mini-screw) implant is an orthodontic innovation that was introduced to circumvent the limitations of conventional anchorage systems. Mini-screws, known as temporary anchorage devices (TADs), give clinicians good control over tooth movement in 3 dimensions and can assist orthodontists in anchorage-demanding cases.
Methods: A questionnaire was distributed by online survey using SurveyMonkey and on paper during orthodontic meetings in Saudi Arabia. Collected data were analyzed using SPSS statistical software (version 23, IBM). A 2-way cross-tabulation and Fisher's exact or Pearson chi-square tests were used to evaluate statistically significant differences. A P-value < 0.05 was considered to be statistically significant.
Results: Of 133 respondents, 72 (54.1%) of practitioners worked in the governmental sector and 61 (45.9%) worked in the private sector. A total of (87.3%) of practitioners in the governmental sector and (80%) of practitioners in the private sector reported using mini-screws in clinical practice. Practitioners who reported that they did not use mini-screws in clinical practice listed the following reasons: "I don't have enough information" (33.3%), "It's a surgeon's job" (11.1%), "Not available in the hospital" (29.6%), and "Other" (25.9%). A total of 60.2% of practitioners loaded mini-screws immediately, 8.3% loaded them 1 week after implantation, 11.3% loaded them 2-3 weeks after implantation, and 3.8% loaded them >3 weeks after implantation. Regarding the method of placement, 63.2% of practitioners used radiography for placement guidance/confirmation, 9.8% used a self-made guide, and 8.3% did not use a guide.
Conclusions: Lack of education and training are major reasons that practitioners do not use orthodontic mini-screws in Saudi Arabia. Increased efforts to organize seminars and workshops may motivate practitioners to incorporate mini-screw usage into routine practice.

Keywords: Mini implants, Mini screws, Orthodontic anchorage procedures, Orthodontics, Orthodontists, Temporary anchorage devices

INTRODUCTION

Orthodontic anchorage is a technique used to avoid undesired tooth movement.[1-3] The miniature screw (mini-screw) implant is an orthodontic innovation that was introduced to circumvent the limitations of conventional anchorage systems.[4] The use of a small metal screw to limit tooth movement was first described by; the screw was designed to endure a sufficient magnitude and duration of constant force during shifting of an anterior maxillary dentition while withstanding any instability, infections, and pathological disturbances.[5,6] Implants are alloplastic devices that are surgically inserted into or secured onto the bone of the craniofacial complex.[7] Mini-screws, known as temporary anchorage devices (TADs), give clinicians good control over tooth movement in 3

dimensions and can assist orthodontists in anchorage-demanding cases.[8]

TADs provide absolute anchorage for many types of orthodontic treatment such as intrusion and distalization.[9-11] TADs improve patient compliance are small and easy to insert and remove, and can be loaded immediately after insertion.[12-16] Yet, the use of orthodontic mini-implants is not without risk; several studies have described mini-screw failure rates and causes of mini-screw failure.[17,18]

A recent study based in France investigated the habits of French orthodontists using mini-screws in clinical practice.[19] Meeran et al, similarly investigated the use of mini-screws among orthodontists in India, and several such studies have been conducted in the United States.[20-22] In contrast, orthodontic mini-screw implants are relatively new in Saudi Arabia, such that no study to date has investigated mini-screw implantation in this context. Therefore, the goal of this research was to assess mini-screw implant use in Saudi Arabia; to identify any problem areas preventing orthodontists from utilizing mini-screws; and to determine whether mini-screw usage varies between the private and govern-mental sectors.

METHODS

This research was approved by the ethics review board of the research center of the Riyadh Colleges of Dentistry and Pharmacy. All participants provided written informed consent. The population was orthodontists in Saudi Arabia and study period was six months for the present study.

Inclusion criteria

Orthdontists including specialists, consultants and post graduate students.

Exclusion criteria

All specialists, consultants and post graduate students other than orthodontic specialty.

A questionnaire was distributed to orthodontists practicing in Saudi Arabia. The questionnaire was completed online using Survey Monkey (https://www.surveymonkey.com) or on paper during orthodontic meetings. This study addressed orthodontists' use of mini-screws using a descriptive analysis of completed questionnaire data and a comparative analysis of orthodontists working in the governmental and private sectors.

Statistical analysis

Collected data were analyzed using SPSS statistical software (version 23, IBM). A 2-way cross-tabulation and Fisher's exact or Pearson chi-square tests were used to evaluate statistically significant differences. A P-value < 0.05 was considered to be statistically significant.

RESULTS

Mini-screw use in orthodontic practice

Demographic information for the surveyed orthodontists is summarized in Table 1.

Table 1: Demographic details of respondents.

Variables		Frequency (N)	Percent (%)
Workplace	Public	72	54.1
	Private	61	45.9
Academic degree	Consultant	48	36.1
	Specialist	54	40.6
	Postgraduate	31	23.3

Table 2: Participants responses regarding event attendance/reading related to orthodontic min-screws.

Variables	Response	
	Frequency (N)	Percent (%)
Seminars	104	33.4
Workshops	100	32.2
Articles	102	32.8
None	5	1.6

Of 133 respondents, 40.6% were specialists, 36.1% were consultants, and 23.3% were postgraduate students. Seventy-two (54.1%) practitioners worked in the governmental sec-tor and 61 (45.9%) worked in the private sector. Orthodontists who were familiar with mini-screws indicated that they attended seminars and workshops or read articles related to orthodontic mini-screws (Table 2).

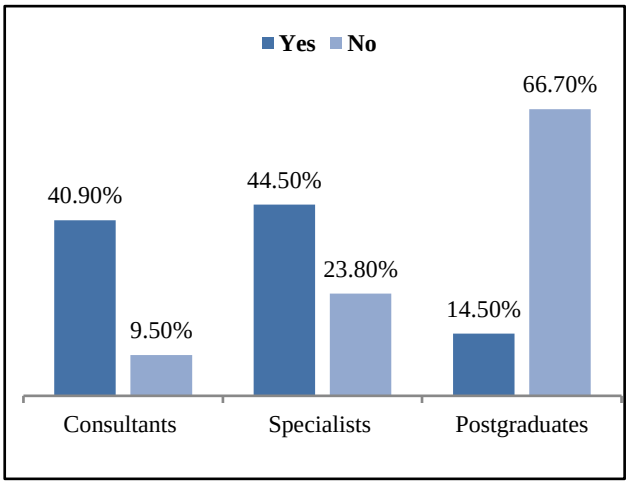

Figure 1: Occupational classification's relation to mini- screw usage.

Of 72 practitioners in the governmental sector, 87.3% reported the use of mini-screws in clinical practice and 12.7% indicated that they had never used mini-screws in clinical practice. Of 61 practitioners in the private sector, 80% reported the use of mini-screws while 12% had never used mini-screws. When the respondents were stratified by occupational classification, 40.9% of consultants had utilized mini-screws compared to 44.5% of specialists and 14.5% of postgraduate students (Figure 1).

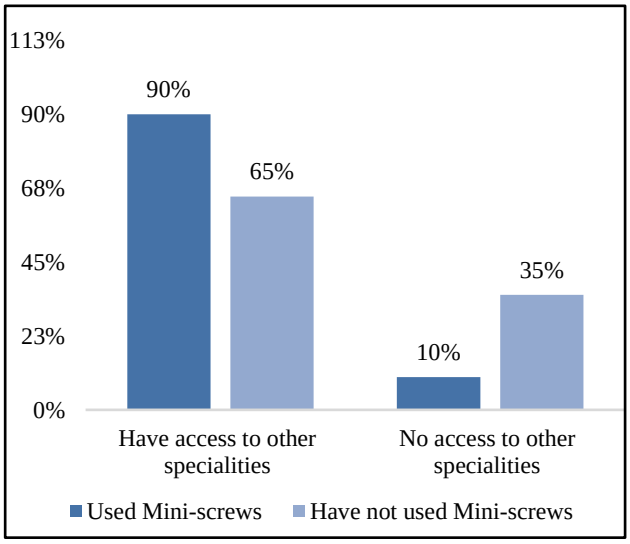

Figure 2: Access to specialties in relation to mini-screw usage.

Most notably, 90% of practitioners with access to other specialties in their work field reported using mini-screws in clinical practice (Figure 2).

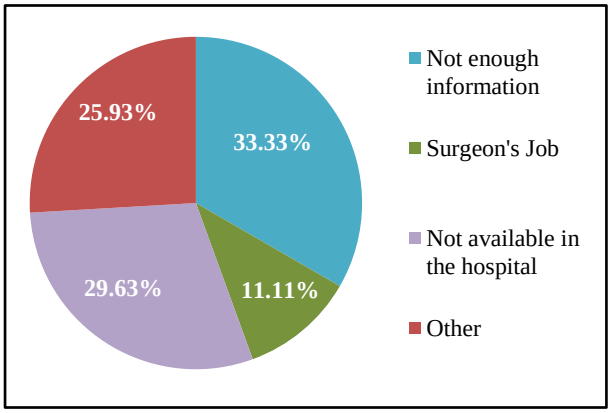

Figure 3: Reasons for not using orthodontic mini-screws.

Indeed, orthodontists with access to other dental specialties were more likely to utilize mini-screws in clinical practice ($p < 0.05$). Further-more, orthodontists working in the public sector were more likely to have access to other dental specialties than those working in the private sector ($p < 0.05$). Practitioners who indicated that they had never used mini-screws in clinical practice listed the following reasons: "I don't have enough information" 33.3%, "It's a surgeon's job" 11.1%, "Not available in the hospital" 29.6%, and "Other" 25.9% (Figure 3).

Mini-screw utilization and success rate

Among practitioners who utilized mini-screws, 48.6% had been using mini-screws for 1-5 years and 46.8% had used mini-screws in only 1-10 cases. Additionally, 22.6% placed mini-screws using a topical anesthetic and 60.2% placed them using local anesthesia.

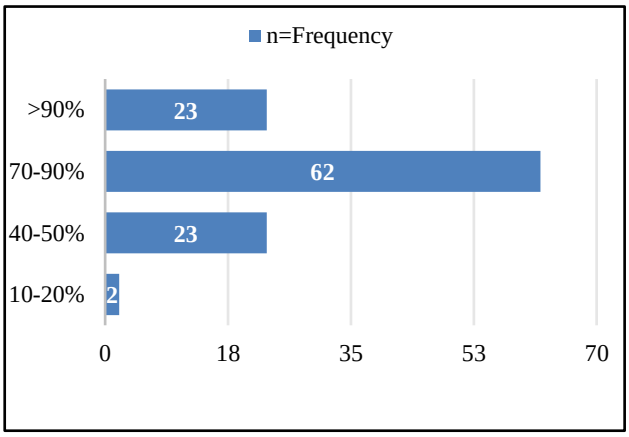

Figure 4: Success rate percentages.

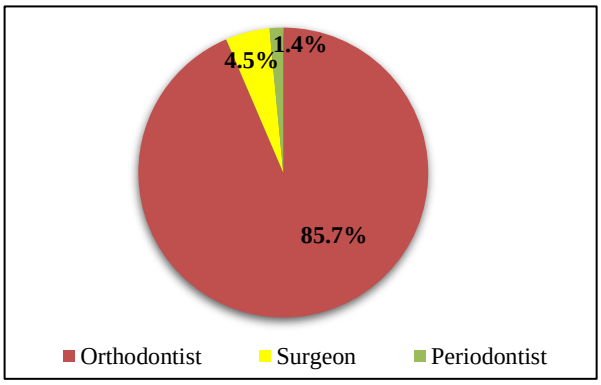

Figure 5: Participants' response on suitable professionals to do orthodontic mini-screws.

A total of 60.2% of practitioners loaded mini-screws immediately, 8.3% loaded them 1 week after implantation, 11.3% loaded them 2-3 weeks after implantation, and 3.8% load-ed them >3 weeks after implantation. Regarding the method of placement, 63.2% of practitioners used radiography for placement guidance/confirmation, 9.8% used a self-made guide, and 8.3% did not use a guide. Table 3 shows the reported durations of mini-screw use, number of cases involving mini-screw use, type of local anesthesia used, loading time, and method of placement. Figure 4 depicts the success rate of mini-screw use reported by orthodontists that used mini-screws in clinical practice. Figure 5

summarizes orthodontist opinions about professionals who are qualified to place orthodontic mini-screws.

Table 3: Response of participants' knowledge on the use of orthodontic mini-screws.

Variables		Frequency (N)	Percent (%)
How long ago did you start using orthodontic mini-screws?	< 1 year	16	14.4
	1-5 years	54	48.6
	> 5 years	41	36.9
In how many cases have you used orthodontic mini-screws?	1-10	52	46.8
	11-50	46	41.4
	> 50	13	11.7
Type of local anesthesia given	Topical	30	27.3
	Injectable	80	72.7
When do you load the mini-screws?	Immediately	80	72.1
	1 week later	11	9.9
	2-3 weeks later	15	13.5
	>3 weeks later	5	4.5
Method used for locating mini-screw placement	Radiographs	84	77.8
	Self-made guide	13	12.0
	No guide needed	11	10.2

DISCUSSION

This study surveyed orthodontists practicing in Saudi Arabia about the use of mini-screws in clinical practice. Authors obtained a good response rate with almost equal numbers of responses from orthodontists in the governmental and private sectors. Most orthodontists were familiar with mini-screws as a result of attending seminars and workshops or reading articles. Yet, familiarity was not synonymous with use in clinical treatments; while more than 2/3 of respondents were familiar with mini-screws, 82.7% had used mini-screws in practice. This value is much higher than values previously reported in India 43.7% and France 66%, but is similar that reported by a survey conducted in the United States 80%.[19-21]

A large proportion of respondents 40.6% in present study indicated that they had been using mini-screws for 1-5 years. A similar proportion of respondents 39.1% indicated that they had only used mini-screws in 1-10 cases, verifying the status of mini-screw implantation as a fairly new technique in Saudi Arabia. There was a statistically significant association between workplace and occupational classification: consultants and postgraduates were more likely to work in the public sector and while specialists typically worked in the private sector ($p < 0.05$). Consultants were more likely to have been using orthodontic mini-screw implants for >5 years, while specialists had been using them for 1-5 years and postgraduates for <1 year ($p < 0.05$).

In this study, professionals had different preferences regarding anesthesia for mini-screw application. Topical anesthesia has the advantage of being well-tolerated by patients and easily applied by dentists; however, our results indicated that most clinicians 60.2% preferred injectable local anesthesia for pain management during mini-screw placement, with only 22.6% of practitioners using topical anesthesia. Another study indicated that most orthodontists 54% used a combination of topical and local anesthesia.[20] In present study, there was no significant association between type of anesthesia and implant success ($p > 0.05$). Moreover, a 70-90% success rate noted by the majority of respondents in this study was consistent with previous studies.[22,23]

There are different guides for mini-screw placement. Many studies have highlighted the use of radiography for mini-screw implantation.[8,16,24] In fact, a majority of clinicians in current study used radiographs for TAD placement 77.8%, while 10.2% placed mini-screws without a guide. The study by Meeran et al, found that while 62.65% of orthodontists used surgical guides, 37.35% did not use a guide for mini-screw placement.[20] Furthermore, 60.2% practitioners in our study indicated that they loaded mini-screws immediately after placement, which is less than that reported in another study 93.6%.[19] Loading time may differ depending on the given case. Authors noted that professionals in the public sector used radiography and immediate loading more frequently than did professionals in the private sector ($p < 0.05$). There was no significant association between mini-screw implantation success and occupational classification, loading time, or method of placement in this study ($p > 0.05$).

Although this study enrolled similar numbers of practitioners who used mini-screws in the public and private sectors, most respondents in the public sector indicated using mini-screws in 1-10 cases while those in the private sector reported use in 11-50 cases ($p < 0.05$). Lower availability of mini-screws is a possible reason for a lower number of cases re-ported in public hospital settings. Accordingly, we believe that access to other dental specialties was not important for mini-screw usage in the public sector. It is notable that practitioners in public hospitals had better access to other dental specialties but still preferred to place mini-screws themselves as orthodontists rather than defer to a surgeon or periodontist.

A majority of respondents 85.7% in this study thought that orthodontists were more suitable than other specialists for administering orthodontic mini-screw treatment (Figure 5). This is consistent with the findings

of Meeran et al, 85.8%.[20] In contrast, a study showed that only 43% of orthodontists preferred to place mini-screws them-selves.[12]

In this study, consultants were more familiar with mini-screws and had more years of experience using them than other professionals ($p < 0.05$). Specialists also showed considerable experience, frequently indicating that they worked on >50 cases involving mini-screws, whereas postgraduates only worked on 1-10 cases. This is consistent with the fact that consultants and specialists have more years of practice than postgraduates; however, awareness about the utility of mini-screws should be emphasized to all clinicians, as information can enhance clinician confidence and the probability of incorporating mini-screws into basic orthodontic procedures.

Finally, present study survey revealed several reasons that practitioners do not utilize mini-screws; for example, 33.3% did not feel that they had sufficient information about mini-screws. Hyde et al, showed that the most common reason for not using mini-screws was the need to administer local anesthesia, while another study 58% described factors including longer chair times and lack of training.[12] Similar to our study, Meeran et al, showed that the major reason for not using mini-screws was a lack of training 67%.[20] Taken together, inadequate training or knowledge about mini-screw implants may be an important obstacle to the use of TADs in clinical practice.

This study had some limitations. The most notable limitation of our study was that the sample size was not taken from all geographic areas in Saudi Arabia; however, the selected areas are considered to be major cities in Saudi Arabia and included its capital.

CONCLUSION

The present study shows that lack of knowledge was a major reason for not using mini-screws in orthodontic practice in Saudi Arabia. In the future, efforts to organize seminars and workshops may help motivate practitioners to utilize mini-screws in everyday clinical practice.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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