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International Journal of Oral Health Dentistry

Journal homepage: www.ijohd.org

Original Research Article

Knowledge and awareness regarding use of surgical stent for implant placement: A cross-sectional study

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Abstract

Background: Accurate implant placement is crucial for achieving long-term functional and esthetic success in dental implantology. Surgical stents serve as a guiding tool to ensure precise positioning, angulation, and depth during implant placement. This study aimed to evaluate knowledge, awareness, and perceptions among dental professionals regarding the use of surgical stents.

Materials and Methods: A cross-sectional questionnaire-based survey was conducted among 152 dental professionals, including BDS graduates, MDS specialists, and dental practitioners. The survey comprised structured questions evaluating perceived accuracy, ease of use, time efficiency, type preferences, challenges encountered, and recommendations for beginner implantologists. Data were analyzed descriptively.

Results: Most participants (49.3%) rated surgical stents as 'moderately accurate' in achieving optimal implant positioning, while 42.1% rated them 'slightly accurate.' About 42.8% strongly agreed and 48% agreed that stents reduce the risk of improper angulation and depth. Regarding accuracy in matching planned and actual positions, 65.8% reported 'sometimes' achieving it, whereas only 17.8% reported 'always.' CAD/CAM-fabricated stents (34.9%) were the most preferred, followed by 3D-printed guides (38.8%). While 53.9% found them 'neutral' in ease of use, 93.4% believed they slightly improved time efficiency. Common challenges included limited mouth opening (13.8%), difficulty in stabilization (46.7%), and inaccuracies despite use (23%). For beginners, 54% 'probably' recommended surgical stents.

Conclusion: While surgical stents are widely recognized for enhancing accuracy and reducing surgical errors, limitations such as difficulty in stabilization and occasional inaccuracies remain. Advances in digital technology, including CAD/CAM and 3D printing, have improved acceptance, yet operator training is essential for maximizing their benefits.

Keywords: Surgical stent, Implant, Accuracy.

Received: 14-08-2025; **Accepted:** 04-10-2025; **Available Online**: 14-10-2025

1. Introduction

Successful dental implant placement depends on precise three-dimensional positioning within the jawbone to ensure optimal load distribution, esthetics, and prosthetic outcomes. Misaligned implants can result in biomechanical complications, compromised esthetics, and patient dissatisfaction.[1-3] Surgical stents, whether conventional acrylic/resin-based, CAD/CAM-fabricated, or 3D-printed, act as intraoperative guides for achieving planned implant positioning.[4]

The integration of digital planning and advanced manufacturing has enhanced the precision of surgical stents.[5,6] However, despite these technological advancements, operator experience, case selection, and patient-specific factors still influence the final outcome. Understanding clinicians' awareness and experiences can help identify knowledge gaps and improve training programs.

This study assesses knowledge, awareness, and clinical perceptions of dental professionals regarding surgical stent use in implant placement.

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https://doi.org/10.18231/j.ijohd.12887.1760177174

2. Materials and Methods

A descriptive cross-sectional study was conducted among 152 dental professionals, including BDS graduates, MDS specialists, and general dental practitioners. Participants responded to a structured Google Forms questionnaire consisting of 10 closed-ended questions. The survey explored perceptions of accuracy, reduction of angulation errors, type preference, ease of use, time efficiency, assistance requirements, common challenges, and recommendations for beginners.

Responses were collected anonymously, and descriptive statistics (frequencies and percentages) were used for analysis.

3. Results

Table 1: Demographic details

Variable	Category	N	%
Age group	**20 -40**	79	52.0
	40-60	73	48.0
Gender	**Female**	101	66.4
	Male	51	33.6
Profession	**BDS**	39	25.7
	Dental Practitioner	21	13.8
	MDS	92	60.5

The study included a total of 152 participants. The age distribution showed that slightly more than half (52%) were in the 20–40 years' group (n=79), while 48% (n=73) were in the 40–60 years group. Female respondents constituted the majority at 66.4% (n=101), compared to males at 33.6% (n=51). In terms of professional qualification, the largest proportion were MDS (60.5%, n=92), followed by BDS graduates (25.7%, n=39), and dental practitioners (13.8%, n=21). This indicates a diverse group with a majority being specialists, providing insights from those with advanced training.

Q. 1. How would you rate the accuracy of surgical stents in achieving optimal implant positioning?

Table 2:

Option	Frequency	Percent
Option 1 - Very accurate	64	42.1
Option 2 - Moderately accurate	75	49.3
Option 3 Slightly accurate	2	1.3
Option 4 Not sure	11	7.2

When asked about the accuracy of surgical stents, 49.3% (n=75) rated them as moderately accurate, while 42.1% (n=64) considered them very accurate. Only a small proportion rated them as slightly accurate (1.3%, n=2), and 7.2% (n=11) were not sure. This demonstrates a generally positive perception of surgical stents, with over 90% acknowledging their usefulness.

Q. 2. Do you believe the use of a surgical stent reduces the risk of improper implant angulation and depth?

Table 3: Distribution of responses to question 2 – Belief that surgical stents reduce risk of improper angulation and depth.

Option	Frequency	Percent
Option 1 Strongly agree	65	42.8
Option 2 Agree	73	48.0
Option 3 Neutral	10	6.6
Option 4 Disagree	4	2.6

A majority agreed that surgical stents help reduce risk: 48% (n=73) agreed and 42.8% (n=65) strongly agreed. Only 6.6% (n=10) were neutral and 2.6% (n=4) disagreed. This reflects a strong consensus regarding the preventive role of stents in minimizing errors.

Q. 3. In your clinical experience, how often has the implant placement matched the planned position when using a stent?

Table 4: Distribution of responses to question 3 – Frequency of achieving planned implant position using a stent.

Option	Frequency	Percent
Option 1 Always	27	17.8
Option 2 Most of the time	100	65.8
Option 3 Sometimes	15	9.9
Option 4 Rarely	10	6.6

About two-thirds (65.8%, n=100) reported that implant placement *matched most of the time*, and 17.8% (n=27) indicated *always*. Meanwhile, 9.9% (n=15) said *sometimes* and 6.6% (n=10) *rarely*. These results suggest that stents generally achieve the desired positioning but may still have limitations in consistency.

Q. 4. Have you encountered any inaccuracies in implant placement even after using a surgical stent?

Table 5 Distribution of responses to question 4 – Inaccuracies in implant placement despite using a surgical stent.

Option	Frequency	Percent
Option 1 - Yes	46	30.3
Option 2 - No	73	48.0
Option 3 - If yes, please specify the type of inaccuracy:	23	15.1
Option 4 - Not sure / Uncertain	10	6.6

While 48% (n=73) reported *no inaccuracies*, 30.3% (n=46) experienced inaccuracies, and 15.1% (n=23) specified the type of inaccuracies. Additionally, 6.6% (n=10) were uncertain. This shows that although surgical stents improve

precision, a significant proportion of clinicians still face challenges.

Q. 5. Which type of stent do you find more accurate for implant placement?

Table 6: Distribution of responses to question 5 – Preference of stent type for implant placement

Option	Frequency	Percent
Option 1 Conventional stent (acrylic/resin-based)	11	7.2
Option 2 CAD/CAM fabricated stent	53	34.9
Option 3 3D-printed surgical guide	59	38.8
Option 4 - I don't have experience with different types	29	19.1

Among the options, 3D-printed guides (38.8%, n=59) and CAD/CAM fabricated stents (34.9%, n=53) were considered more accurate compared to conventional stents (7.2%, n=11). Notably, 19.1% (n=29) lacked experience with different types. These findings reflect a shift towards digitally designed stents in clinical practice.

Q. 6. How would you rate the ease of using a surgical stent during implant surgery?

Table 7: Distribution of responses to question 6 – Ease of using surgical stents during implant surgery

Option	Frequency	Percent
Option 1 Very easy	37	24.3
Option 2 - Easy	82	53.9
Option 3 Neutral	22	14.5
Option 4 Difficult	7	4.6
Option 5 - Very difficult	4	2.6

More than half (53.9%, n=82) found stents *easy to use*, and 24.3% (n=37) found them *very easy*. Only 14.5% (n=22) were neutral, while 4.6% (n=7) found them *difficult* and 2.6% (n=4) *very difficult*. Overall, this highlights a high level of user-friendliness.

Q. 7. Does the use of a stent make the implant placement procedure more time-efficient?

Table 8: Distribution of responses to question 7 – Perceptions of surgical stents improving time efficiency.

Option	Frequency	Percent
Option 1 Yes, significantly	71	46.7
Option 2 Yes, slightly	71	46.7
Option 3 No change	5	3.3
Option 4 It increases surgical time	5	3.3

Most respondents (93.4%) perceived that stents enhance time efficiency. Specifically, 46.7% (n=71) felt they *significantly* reduce time and another 46.7% (n=71) said they *slightly* reduce time. Only 3.3% (n=5) reported *no change* and another 3.3% (n=5) felt it *increased surgical time*.

Q. 8. Do you require assistance while placing implants using a surgical stent?

Over half (53.3%, n=81) reported they *sometimes* need assistance, while 33.6% (n=51) said *always*. Conversely, 9.9% (n=15) needed help *rarely* and only 3.3% (n=5) *never*. This indicates that despite their advantages, surgical stents often require team support during use.

Q. 9. What challenges do you face while using surgical stents? (Multiple answers allowed)

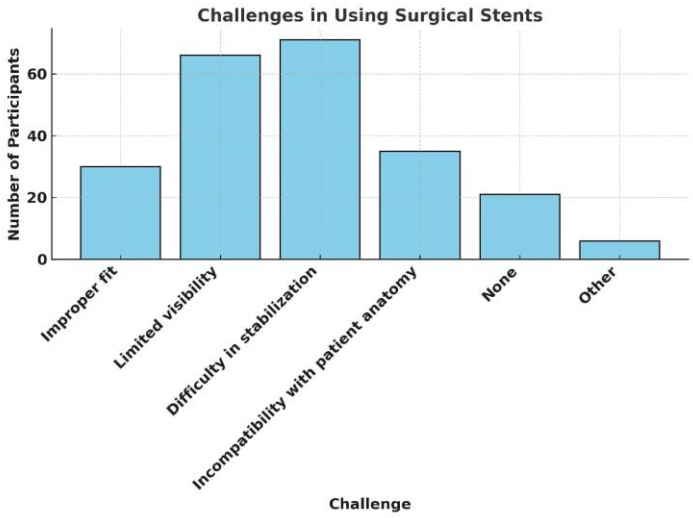

Figure 1: Responses to question 9 – challenges while using surgical stents

The most reported challenges were difficulty in stabilization (46.7%, n=71) and limited visibility (43.4%, n=66). Other issues included incompatibility with patient anatomy (23%, n=35) and improper fit (19.7%, n=30). A smaller proportion reported no challenges (13.8%, n=21) or other issues (3.9%, n=6), such as restricted mouth opening in posterior regions and lack of prior experience. These findings suggest that while stents are beneficial, practical difficulties in intraoral use remain.

Q. 10. Would you recommend the use of surgical stents for beginner implantologists?

A majority were in favor, with 54.6% (n=83) saying *definitely yes* and 31.6% (n=48) *probably yes*. Only 7.9% (n=12) were *not sure* and 5.9% (n=9) said *probably no*. This indicates strong support for incorporating surgical stents as a learning aid for beginners.

4. Discussion

The study highlights that while a substantial proportion of practitioners exhibit moderate confidence in the accuracy of surgical stents, complete reliability is not universally

perceived. This observation aligns with existing literature indicating that, although stents can significantly enhance surgical predictability, the final precision is still influenced by multiple variables including the clinician's surgical skill, patient anatomy, bone density, and intraoperative constraints.[7,8] Even in cases where a stent is meticulously fabricated, factors such as patient movement, difficulty in securing the guide, and variations in mucosal thickness can introduce deviations from the planned trajectory.

CAD/CAM-fabricated and 3D-printed surgical guides emerged as the most preferred modalities among respondents, surpassing conventional acrylic/resin stents. Their enhanced precision stems from integration with digital imaging, which allows three-dimensional visualization, virtual implant planning, and the incorporation of exact angulations and depths into the guide design.[9,10] This high level of customization increases adaptability across varied clinical scenarios, from single-tooth replacement to full-arch rehabilitations. However, their effectiveness is still contingent upon accurate data acquisition during CBCT scanning and digital impression procedures; errors at these stages can propagate into the final outcome.

Reported challenges such as limited mouth opening and difficulty in stabilization reinforce the importance of comprehensive preoperative planning. This includes evaluating inter-arch space, identifying undercuts, and modifying guide designs to accommodate patient-specific anatomic limitations.[11]For patients with restricted access or complex ridge morphology, hybrid or sectional guide systems may provide a practical alternative. Additionally, stability during drilling can be enhanced through auxiliary fixation screws or pin-supported guides, particularly in edentulous arches.

A notable finding of the present study is that many clinicians only "sometimes" achieve planned implant positioning despite using a surgical stent. This underlines the essential role of operator training, not only in the technical aspects of implantology but also in understanding the inherent tolerances and mechanical behavior of surgical guides.[12] Continuous hands-on experience, simulation-based training, and periodic calibration of clinical protocols can bridge the gap between planned and executed implant positions.

Although digital workflows offer the potential for near-perfect accuracy, awareness of their limitations remains crucial. Deviations can still occur due to factors such as drill wear, improper seating of the guide, or unanticipated intraoperative anatomical variations. Therefore, careful case selection, along with the readiness to modify the plan intraoperatively, is vital for ensuring success. For beginner implantologists, surgical stents serve as an invaluable tool by providing visual and tactile guidance, thereby reducing the cognitive load during surgery.[13,14] However, an overreliance on the guide without mastering foundational surgical principles—such as maintaining tactile feedback, understanding bone quality, and adjusting for soft-tissue resistance—may compromise long-term outcomes.[15,16] Thus, balanced integration of technology with sound clinical judgment remains the hallmark of successful implant placement.

5. Conclusion

Surgical stents play a significant role in enhancing implant placement accuracy and reducing surgical errors. Digital innovations have improved their acceptance, yet limitations persist. Training, case selection, and patient-specific design modifications are crucial for optimizing results.

6. Source of Funding

None.

7. Conflict of Interest

None.

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Cite this article: Rajguru V, Diwase H, Mahale K, Khalikar SA, Mahajan SV, Tandle U. Knowledge and awareness regarding use of surgical stent for implant placement: A cross-sectional study. *Int J Oral Health Dent*. 2025;11(3):230–234.