



Knowledge, Awareness Of Dental Practitioners On Dynamic Navigation- A Questionnaire Study.

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Abstract

In today's fast-moving, competitive world, we are always on the lookout for the quickest, most convenient, and most accurate method of treatment. Dental implants need to be placed accurately at the proper depth, angulation, and crestal position. Optimal occlusion and preserving the health of the peri-implant tissues with good dental hygiene and appropriate implant loading are prerequisites for ideal implant implantation, which favours good aesthetic and prosthetic outcomes. Over the course of several decades implant dentistry has evolved to include 3-dimensionally (3D) planned and guided surgery. Dynamic navigation, one of the most recent advancements, may enable surgeons to place implants with precision comparable to stereolithographic guidance based on 3D, prosthetically driven designs. Nowadays, guided, full-arch, immediate-function therapy for the edentulous and terminally dentate patient is easier to administer and more predictable because of the development of intraoral surface scanners and computer-aided design/computer-aided milling (CAD/CAM). This questionnaire was undertaken to assess the knowledge and awareness of dental practitioners on Dynamic Navigation system.

Keywords: Dental implants, Computer guided Implant Surgery, Static guides, Dynamic navigation

Introduction

In comparison to other restoration methods like bridges and dentures, dental implants are frequently utilised to restore missing teeth and offer advantages. Without affecting adjacent teeth, implants restore shape and function. They also stabilise alveolar bone and produce predictable long-term results[1]. Implants play a major role in determining the efficiency of the core practices among dental practitioners[2]. Implant treatment comprises of basically three phases including treatment planning, surgical and prosthetic phase.

Computer guided implant surgery (CGIS), which was first introduced in 1999, has been one of the most rapidly developing fields in digital dentistry. Essentially, it entails performing a computed

tomography (CT) scan of the jaw, picturing the intended prosthesis, inserting a virtual implant, and creating a stereolithographic surgical guide for the actual implant placement[3].

When it comes to planning and positioning of implants, implantologists have many alternatives. This begins with assessing the occlusion and positioning the virtual teeth's restorative envelope in the appropriate occlusal position[4]. They can also be benefited from Cone Beam Computed Tomography (CBCT) data interaction because it improves treatment planning assessment based on data including linear relative bone quality, 3D evaluation of ridge shape, and proximity to important anatomic structures[5]. Most dental implants are currently

placed by hand, without any kind of computerised 3-D planning. Inaccurate alignment is directly responsible for a large number of dental implant insertion difficulties[4].

Accelerating technology advancements in office-based imaging and sophisticated simulation and planning software have aided dental implant treatment planning and installation. The invention of static implant guides to enable predicted accuracy in implant placement was made possible by the integration of software and imaging[6]. Static systems build stents with metal tubes using computer-aided design and manufacturing using CT images, while surgical systems use coordinated instrumentation to place implants using the guide stent. Without the option to alter the stent, the implant position is dependent on the stent. It is not possible to shift positions during surgery[7].

A promising development in CBCT-guided surgery that could increase placement accuracy is dynamic navigation. Real-time position accuracy validation and verification show considerable promise for improving surgical transparency and accountability to improve patient outcomes[8]. Guided implant surgery provides precise, effective, and efficient implant placement compared to freehand implant surgery without damaging the critical anatomic dental structures[2]. Dynamic Navigation makes use of systems working with a camera recording the position of the patient and a screen displaying the position of the drills onto Cone Beam Computer Tomography (CBCT) images in real-time during surgery and uses optical technologies to track the patient and the hand piece and displays the images onto a monitor[9].

By giving surgeons a real-time navigation tool to increase the precision of implant placement, dynamic navigation has improved the process[4]. However, dynamic navigation is indicated for any of the following: Placement of implants in patients with a limited mouth opening, Placement of the implant on the same day of the CBCT scan, Placement of implants in difficult-to-access locations such as the second molar, Placement of implants when direct visualization will be difficult, Placement of implants in tight interdental spaces when static guides cannot be used owing to tube size, Placement of implants adjacent to natural teeth in situations in which static

guide tubes will interfere with ideal implant placement. Dynamic navigation is flexible, allowing the clinician to change the surgical plan as the clinical situation dictates. It also requires no laboratory work, thus allowing for immediate scanning, planning, and guidance on the same day as patient presentation. The clinician must understand that a learning curve is required to gain proficiency. This could require additional time for training, simulation, and practice on a manikin[10].

Advantages of Dynamic Navigation includes Real-time feedback ,Takes Less time , A streamlined digital workflow, Improved surgical visualization, Adaptability to intraoperative findings, Ability to change the implant size, system, and location during the surgical procedure[11]. Along with requiring less intrusive flap reflection than free-hand techniques, it also lessens the damage to the surgeon by improving posture and reducing back and neck bending[12].

During endodontic surgery, the dynamic navigation system enabled the operator to precisely carry out minimally invasive osteotomy and root end excision. The creation of specialised surgical navigation systems may make operator movements easier and lower the possibility of iatrogenic mishaps. Future dental procedures will use minimally invasive approaches[13].

Hence, this study was undertaken with an intent to assess and understand the knowledge, awareness regarding use of Dynamic navigation system among, postgraduate students and dental practitioners who are placing implants.

Materials And Methods:

A cross-sectional questionnaire-based study was conducted at Rajarajeswari Dental College, Bangalore, Karnataka, India, between February 2023 to March 2023 which focused on the dental practitioners placing implants, postgraduate students who are practicing placing implants from various colleges across Karnataka and Andhra Pradesh. The institutional ethical committee approval was obtained.

INCLUSION AND EXCLUSION CRITERIA:

The study included postgraduate students placing implants, implant practitioners from different dental clinics and hospitals. Along with the questionnaire,

informed consent was obtained from these participants via google forms. Participants who refused consent to participate in the study were excluded. The undergraduate students of I, II III, IV BDS, Interns and post graduate students and clinicians who are not practicing placing implants were excluded from the study

Questionnaire:

The custom questionnaire was designed, comprising of 17 questions. Each question had to be answered by the participants. The data was gathered by circulating the printed sheets containing questions and also sending the link of the online form via emails and WhatsApp to all the study participants. The study participants were given sufficient time of two weeks to complete the online questionnaire. The resultant data was tabulated and subjected to statistical analysis to draw a conclusion from the resultant study.

Statistical Analysis:

The individual responses obtained from all participants were collated on MS Excel sheet. Statistical analysis was carried out using Statistical Package for the Social Sciences (SPSS) Software version 20.0 and Chi-square test was utilised to check if there was any significant association between the questionnaire items and the type of practitioner with a significance level of p-value <0.05.

Results:

A total of 248 participants filled the questionnaire out of which 138(55.6%) respondents were postgraduate students,110(44.4%) were clinicians (Table :1)

Among all,71%(n=98) of the postgraduate students and 83%(n=92) of clinicians came across latest practices in placing implants.

When asked about the mode of implant placement, conventional is preferred by 45% (n=63) of post graduate students,60% (n=67) clinicians, whereas guided mode of implant placement is preferred by 54%(n=75) of post graduate students, 39% (n=43) of clinicians preferred guided mode of implant placement.

When asked about their preference for Dynamic navigation over guided, 65%(n=91) of post graduate students preferred Dynamic navigation,whereas 78%(n=86) clinicians preferred Dynamic navigation

and 19% (n=27) of post graduate students came across Dynamic navigation in their clinical practice and only 7.3%(n=8) of clinicians came across Dynamic navigation.

Only 6.5% (n=9) of postgraduate students who were surveyed about their understanding of dynamic navigation reported having a thorough understanding, whereas none of the clinicians reported having a thorough understanding.

When asked whether they have liked the concept of Dynamic navigation or not 67% (n=93) of post graduate students ,81%(n=90) of clinicians liked the concept of Dynamic navigation and 32.6%(n=45) of post graduate students,18.2%(n=20) of clinicians did not like the concept of dynamic navigation.

When asked about whether they like to use Dynamic navigation in their clinical practice,60.9% (n=84) of post graduate students,71.8%(n=79) of clinicians would like to use Dynamic navigation in their clinical practice, whereas 39.1% (n=54) of post graduate students and 28.2% (n=31) of clinicians does not like to use dynamic navigation in their clinical practice.

When asked about whether they have used dynamic navigation system none of the post graduate students used only 20%(n=22) of clinicians have used Dynamic navigation system. 67%(n=93) of post graduate students ,65.5%(n=72) of clinicians think that Dynamic navigation placed implants are more accurate and precise whereas 32.6%(n=45) of post graduate students,34.5%(n=38) of clinicians thinks that conventionally placed implants are more accurate and precise.

When asked about comparison of time taken for placement of implants using conventional or Dynamic Navigation 87.0%(n=120) of post graduate students and 65.5%(n=72) of clinicians think that use of Dynamic navigation takes less time for implant placement whereas 13%(n=18) of post graduate students and 34.5%(n=38) of clinicians think that placing implants using conventional method takes less time.

93.5%(n=129) of post graduate students,100%(n=110) of clinicians thinks that cost is the main drawback of using Dynamic navigation.

When asked about whether they have had any special training in using Dynamic Navigation 56%(n=78) of

post graduate students, 41.8% (n=46) of clinicians had special training in using the Dynamic navigation, whereas 43.5% (n=60) of post graduate students 58.2% (n=64) of clinicians did not have any special training in using the Dynamic navigation.

When asked about the patient acceptance while placing implants using Dynamic navigation,

59.4% (n=82) of post graduate students, 81.8% (n=90) of clinicians think that patient will accept placing implants using Dynamic navigation.

93.5% (n=129) of post graduate students and 100% (n=110) of clinicians are ready to place implants using Dynamic navigation if given a chance.

Table 1: Demographic details

Profession	Frequency	Percent
Post graduate	138	55.6
Clinician	110	44.4
Total	248	100.0

Table 2: Responses to the questions related to knowledge awareness regarding the dynamic navigation system.

Questions related to knowledge awareness regarding dynamic navigation	Frequency	Percent
Are you an Implant Practitioner [OR] Do you come across implants in your daily practice?		
Yes	190	76.6
No	58	23.4
Have you come across latest practices in implants		
Yes	190	76.6
No	58	23.4
Which is the mode of implant placement you generally prefer		
Conventional	130	52.4
guided	118	47.6
Dynamic Navigation	0	0
Do you prefer Dynamic navigation over guided?		
Yes	177	71.4
No	71	28.6
Did you come across Dynamic navigation system in your clinical practice?		
Yes	35	14.1
No	213	85.9

If you came across how much did you understand about dynamic navigation?		
very well	9	3.6
well	152	61.3
did not understand	87	35.1
If you understood the concept of Dynamic navigation did you like that concept?		
Yes	183	73.8
No	65	26.2
Do you like to use Dynamic navigation in your clinical practice		
Yes	163	65.7
No	85	34.3
Have you used Dynamic navigation system		

Yes	22	8.9
No	226	91.1
if yes how many implants you have placed using Dynamic navigation?		
0	244	98.4
1	2	0.8
6	2	0.8
Do you think conventional placement of implant is more accurate or Dynamic navigation placed implants are more accurate and precise.		
Dynamic navigation	165	66.5
conventionally placed implants	83	33.5
Do you think placing implants by using Dynamic navigation takes less time when compared to conventionally placed implants?		
Yes	192	77.4
No	56	22.6
Do you think cost is the main drawback of using Dynamic navigation		
Yes	239	96.4
No	9	3.6
Have you had any special training in using Dynamic Navigation?(if you did not have are you interested in taking special training for using Dynamic navigation?)		
Yes	124	50.0

No	124	50.0
Do you think patient will accept placing implants using Dynamic navigation or patient will be more comfortable placing implants using conventional method.		
Dynamic navigation	172	69.4
conventionally placed implants	76	30.6
If given a chance will you be ready to place implants using Dynamic navigation		
Yes	239	96.4
No	9	3.6

Table :3 Responses of study participants to the questions related to knowledge awareness regarding the dynamic navigation system

		Post graduate	Clinician	χ^2 value	pvalue
Are you an Implant Practioner [OR]Do you come across implants in your daily practice?					
Yes	N	89	101	25.5	<0.001*
	%	64.5%	91.8%		
No	N	49	9		
	%	35.5%	8.2%		
Have you come across latest practices in implants					
Yes	N	98	92	5.442	0.023*
	%	71.0%	83.6%		
No	N	40	18		
	%	29.0%	16.4%		
Which is the mode of implant placement you generally prefer					
Conventional	N	63	67	5.71	0.021*
	%	45.7%	60.9%		
Guided	N	75	43		
	%	54.3%	39.1%		
Dynamic Navigation	N	0	0		
	%	0%	0%		
Do you prefer Dynamic navigation over guided?					

Yes	N	91	86	4.48	0.035*
	%	65.9%	78.2%		
No	N	47	24		
	%	34.1%	21.8%		
Did you come across Dynamic navigation system in your clinical practice?					
Yes	N	27	8	7.63	0.006*
	%	19.6%	7.3%		
No	N	111	102		
	%	80.4%	92.7%		
If you came across how much did you understand about dynamic navigation?					
very well	N	9	0	113.4	<0.001*

	%	6.5%	0.0%		
well	N	44	108		
	%	31.9%	98.2%		
did not understand	N	85	2		
	%	61.6%	1.8%		
If you understood the concept of Dynamic navigation did you like that concept?					
Yes	N	93	90	6.57	0.010*
	%	67.4%	81.8%		
No	N	45	20		
	%	32.6%	18.2%		
Do you like to use Dynamic navigation in your clinical practice					
Yes	N	84	79	3.257	0.08(NS)
	%	60.9%	71.8%		
No	N	54	31		
	%	39.1%	28.2%		
Have you used Dynamic navigation system					
Yes	N	0	22	30.28	<0.001*
	%	0.0%	20.0%		

No	N	138	88		
	%	100.0%	80.0%		
if yes how many implants you have placed using Dynamic navigation?					
0	N	138	106	5.10	0.08(NS)
	%	100.0%	96.4%		
1	N	0	2		
	%	0.0%	1.8%		
6	N	0	2		
	%	0.0%	1.8%		
Do you think conventional placement of implant is more accurate or Dynamic navigation placed implants are more accurate and precise.					
Dynamic navigation	N	93	72	0.123	0.748(NS)
	%	67.4%	65.5%		

conventionally placed implants	N	45	38		
	%	32.6%	34.5%		
Do you think placing implants by using Dynamic navigation takes less time when compared to conventionally placed implants					
Yes	N	120	72	16.188	<0.001*
	%	87.0%	65.5%		
No	N	18	38		
	%	13.0%	34.5%		
Do you think cost is the main drawback of using Dynamic navigation					
Yes	N	129	110	7.44	0.005*
	%	93.5%	100.0%		
No	N	9	0		
	%	6.5%	0.0%		
Have you had any special training in using Dynamic Navigation?(if you did not have are you interested in taking special training for using Dynamic navigation?)					
Yes	N	78	46	5.293	0.021*

	%	56.5%	41.8%		
No	N	60	64		
	%	43.5%	58.2%		
Do you think patient will accept placing implants using Dynamicnavigation or patient will be more comfortable placing implants usingconventional method					
Dynamic navigation	N	82	90	14.44	<0.001*
	%	59.4%	81.8%		
conventionally placed implants	N	56	20		
	%	40.6%	18.2%		
If given a chance will you be ready to place implantsusing Dynamic navigation?					
Yes	N	129	110	7.44	0.005*
	%	93.5%	100.0%		
No	N	9	0		
	%	6.5%	0.0%		

Discussion:

Following the introduction of virtual dental implant planning in 1999, computer guided implant surgery (CGIS) has been one of the most evolving areas in digital dentistry.

Principally, it involves computed tomography (CT) of the jaw, imaging of the planned prosthesis, placement of a virtual implant, and production of a stereolithographic surgical guide for the actual placement of the implant. This technology facilitates surgical execution of implant placement based on ideal prosthetic positioning and radiographic anatomic considerations. When introduced, advantages anticipated were increased accuracy of implant position, reduced surgery invasiveness, shortened chair-side time, and increased patient acceptance of dental implant treatment. Additionally, numerous studies have reported an implant survival rate of 91% to 100% with CGIS[3].

In the present study Although 71.4%of participants prefer Dynamic Navigation over guided only 14.1% came across Dynamic N avigation and the Concept of Dynamic N avigation was liked by 73.8%in that only

36% of participants very well understood the concept,61.3% of participants well understood the concept whereas 35.1% of participants did not understand the concept.

Most of the participants i.e 65.7% are interested towards using Dynamic Navigation in their clinical practice but only 8.9% of participants used this system, where as 91.1% of participants have not used dynamic navigation system, this results was same as that of results of krishnakumar lahoti where 97% practitioners were interested in using CGIS, only 40% had actually reported using them. Accessibility to training courses and the pre operative implant planning software was considered as the most common limitation by majority of the practitioners. The limited accessibility and high cost were the major disadvantages of CGIS. The treatment planning time is longer for CGIS as there are multiple steps involved in the protocol. Learning and using the advanced equipments and planning softwares makes the learning curve steeper for practitioners who have minimum experience and no training. Also, the communication with the production centres was a disadvantage as acknowledged by the practitioners.

All these factors caused a significant hindrance leading to the limited use of CGIS. Despite the interest in CGIS, these hindrances have limited the use[14]

Although 66.5% people think that implants placed with Dynamic Navigation is more accurate and precise 98.4% of participants did not place a single implant using Dynamic Navigation.

Time needed for surgical procedure is less for CGIS, more time has to be invested in the preoperative planning. In the study given by Arisan V et al., in 2010 stated that the duration of treatment was half for guided flapless surgery compared to the conventional way[15].

These results are same as that of present study where 77.4% of participants agreed that Dynamic Navigation takes less time when compared to conventional method of implant placement 96.4% of participants thinks that cost is the major drawback to use Dynamic Navigation in their clinical practice and same percentage of people are ready to place implants using Dynamic Navigation when given a chance[14].

Although 69.4% of participants thinks that patient will accept implants placed using Dynamic Navigation, only 50% of participants had special training in using Dynamic

Navigation because of poor accessibility to training courses on Dynamic Navigation across the country, these factors speculated to hinder the utilisation of this system. Educational programs to train the practitioners would improve the understanding and utilisation of the computer guided implant technology which would further optimum the treatment outcomes in patients requiring rehabilitation with dental implant[14].

Conclusion:

While a number of factors influence implant success, 3D implant location appears to be the most crucial. Dynamic navigation is a promising advancement in CBCT-guided surgery that may improve placement accuracy. Validating and verifying real-time position accuracy holds great promise for enhancing surgical accountability and transparency to improve patient outcomes. The use of dynamic navigation helps implant surgeons get precise results for implant site

preparation. This issue is unlikely to be related to the operator's guided surgery and implantology skills.

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