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## Knowledge, Attitude and Practice on Guided Implant Surgery Among Undergraduate Dental Students

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**Abstract:** Dental implant surgery is the procedure in which replaces both the missing tooth and root with a stable, metal post called an implant. There are many significant drawbacks to the dental procedure and they include time consuming and invasive, a longer duration of treatment, patient cooperation, expensive, need for precision and subsequent follow up visits. A guided implant surgery is when the dentist utilizes advanced machinery and imaging technology to aid in the manufacture and placement of the dental implant in a more efficient, precise and accurate manner. The aim of this study is to assess the knowledge of Undergraduate students in the field of implantology and to check their views regarding easier and more accurate placement of implants. A questionnaire based survey was done among 100 dental students. Probing questions regarding their knowledge of guided implant surgery were asked. The results were tabulated and analysed to get the result. It was seen that the majority of the students were aware of the advances in dental implantology. They understood the advantages of a guided implant surgery

**Key words:** Accuracy, Guided implant surgery, Imaging, Precision, Treatment planning

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### INTRODUCTION

Tooth loss is a very common problem among patients, and therefore there have been many developments in the treatments to aid in the replacements. One of the many profound advances is the development of dental implants. Dental implants are one of the most historically significant developments in dentistry.(Gaviria et al., 2014) They have become the standard care of rehabilitation of missing teeth.(Karthik et al., 2013) Dental implant surgery is a procedure that replaces a missing or diseased tooth and its root with a stable metal post. The metal post is then topped with a tooth like crown. Initially, when introduced, the placement of implants would involve a surgical specialist and a second clinician to restore the implant.

The procedure is both time-consuming and invasive.(Pettersson et al., 2012) A bone graft may be required if the patient has a reduced bone density, and several months of healing is required before placing the crown. There are many factors that are taken into consideration when planning an implant for a patient. Patient history along with clinical examination is the most important aspect during treatment planning. Patients with poor general health, which could interfere with the surgical treatment and require medical supervision are contraindicated, particularly in older patients. In clinical examination, the patient should have adequate length and width of the edentulous area. The site should have adequate bone density and the periodontium should be able to support the placement of the implant.

Among various complications, bleeding from the implant site, infection, pain are all early signs of complications.(Raikar et al., 2017) The factors that affect the success of a dental implant would include the host response to the implant placement, the placement and position of the implant in the arch, age and gender of the patient, adverse habits, systemic diseases and oral hygiene. During the placement of the implant into the jaw bone, accurate placement and positioning is required in order to ensure success of the treatment. The underlying anatomy and adjacent teeth should be preserved and it should be minimally invasive. This is where the role of Guided Implant Surgery comes into play.

Guided Implant Surgery is when the dentist utilizes advanced machinery and imaging technology to guide or aid them to manufacture and place dental implants in a more efficient, precise and accurate manner.(DENTAL SUPPLEMENT et al., 2020) The advances in digital technology have enabled dentists to virtually plan and

fabricate highly accurate surgical guides that facilitate precise implant positioning. (Widmann et al., 2004) This has ensured proper diagnosis and treatment planning to take place and also enabled the communication of the case from dentist to dentist.

Digital technology has greatly aided in the initial stages of treatments by allowing dentists to visualize three-dimensional information of the patient. Details regarding the availability of bone and ideal position of the restoration can be viewed via Cone Beam Computed Tomography (CBCT). These radiographic guides can later be converted into a surgical guide. Advances in CAD/CAM allow the fabrication of highly accurate surgical guides that facilitate precise implant positioning.

Previously, our department has published extensive researches on various aspects of prosthetic dentistry ((Nesappan and Ariga, 2014)(Gupta, Dhanraj and Sivagami, 2010)(Gupta, Dhanraj and Sivagami, 2010; Vidhya and Nesappan, 2016)(Ashok et al., 2014)(Anbu et al., 2019)(Venugopalan et al., 2014; Anbu et al., 2019)(Balaji and Gajendran, 2018)(Madhavan and Gajendran, 2018)(Janani, Janani and Gajendran, 2018)(Janani, Janani and Gajendran, 2018; Abhinav et al., 2019)(Sweta, Abhinav and Ramesh, 2019)(Abdul Wahab et al., 2017; Sweta, Abhinav and Ramesh, 2019)(Ganapathy, Kannan and Venugopalan, 2017)(Pandurangan, Veeraiyan and Nesappan, 2020)(Kannan and Venugopalan, 2018)), this vast research experience has inspired us to research about Guided implant surgery and its implications in implant placement. Our team has rich experience in research and we have collaborated with numerous authors over various topics in the past decade (Deogade, Gupta and Ariga, 2018; Ezhilarasan, 2018; Ezhilarasan, Sokal and Najimi, 2018; Jeevanandan and Govindaraju, 2018; J et al., 2018; Menon et al., 2018; Prabakar et al., 2018; Rajeshkumar et al., 2018, 2019; Vishnu Prasad et al., 2018; Wahab et al., 2018; Dua et al., 2019; Duraisamy et al., 2019; Ezhilarasan, Apoorva and Ashok Vardhan, 2019; Gheena and Ezhilarasan, 2019; Malli Sureshbabu et al., 2019; Mehta et al., 2019; Panchal, Jeevanandan and Subramanian, 2019; Rajendran et al., 2019; Ramakrishnan, Dhanalakshmi and Subramanian, 2019; Sharma et al., 2019; Varghese, Ramesh and Veeraiyan, 2019; Gomathi et al., 2020; Samuel, Acharya and Rao, 2020)

## MATERIALS AND METHOD

A questionnaire based study was conducted among 100 dental students to assess their knowledge regarding guided implant surgery. Probing questions regarding their knowledge of guided implant surgery were asked and they include:

1. Are you aware about the recent advances in dental implantology
2. Are you aware of the term "Guided Implant Surgery"
3. Do you think that guided implant surgery would aid in the success of dental implants
4. Do you think that guided implant surgery is a more precise and accurate procedure for placing implants?
5. Do you think that guided implant surgery helps in the preservation of anatomical structures?
6. Do you think that guided implant surgery requires the surgeon to invest in a specialised surgical kit and planning software?
7. Do you think guided implant surgery can be performed in cases where there is decreased bone volume?
8. Are you aware that the special drill kit consists of tissue punch, drill sleeve and drills of various lengths

The results gathered from the survey were tabulated and analysed.

## RESULTS AND DISCUSSION

A total of 100 Undergraduate students were considered in this survey. 8 questions regarding the various aspects of guided implant surgery were analysed. The results of the survey are tabulated as shown in Table 1

1. Are you aware about the recent advances in dental implantology

76% of the students were aware of the recent advances in dental implantology, whereas 24% of them were not completely aware. (Figure 1)

2. Are you aware of the term "Guided Implant Surgery"

85% of the students know and are aware of Guided implant surgeries and its uses in implant placement. 15% of the students were not aware of it. (Figure 2)

3. Do you think that guided implant surgery would aid in the success of dental implants

97% of the students stated that guided implant surgery would increase the possibility of a successful implant placement. 3% of the students stated otherwise. (Figure 3)

4. Do you think that guided implant surgery is a more precise and accurate procedure for placing implants

Majority of the students (96%) stated that it would aid in a more precise and accurate placement of dental implants. (Figure 4)

5. Do you think that guided implant surgery helps in the preservation of anatomical structures

96% of the students were aware that guided implant surgery would aid in the better preservation of anatomical structures in the oral cavity during implant placement. (Figure 5)

6. Do you think that guided implant surgery requires the surgeon to invest in a specialised surgical kit and planning software

54% of the students stated that guided implant surgery would require a specific surgical kit and a planning software. The remaining 46% stated it was not required, (Figure 6)

7. Do you think guided implant surgery can be performed in cases where there is decreased bone volume?

68% of the students stated that implants can be placed in areas with decreased bone volumes with the help of guided implant surgery. 32% of the students did not think it was possible. (Figure 7)

8. Are you aware that the special drill kit consists of tissue punch, drill sleeve and drills of various lengths

33% of the students stated yes and 67% of the students were not aware. (Figure 8)

The various protocols for dental implant placement have been spread worldwide among dentists. Common procedures and standardised implants have made it easier, more effective and successful. Dental implants have become a huge evolution in regard with dental rehabilitations. The current trend in dental implant surgeries is to further improve on clinical procedures to ensure a reduced treatment duration and less invasive techniques to preserve the remaining natural structures to the best of the clinicians abilities. Guided implant protocols can aid in simplifying procedures with better diagnosis and treatment planning during the diagnostic phase and also better plan the prosthetic restoration. (Colombo et al., 2017)

The recent advances in dental implants would include the various different types of implant surface modifications that lead to better osseointegration with the bone. One of the key modifications would be increasing the surface roughness of dental implants by various methods such as machining, plasma spray coating, grit blasting, acid etching, sandblasted and acid etching (SLA), anodizing, and biomimetic coating. (Hong and Oh, 2017)(Smeets et al., 2016) Immediate loading of the implant has been seen to be having increased success rates. Procedures such as guided bone regeneration, block bone grafting, maxillary sinus lift, distraction osteogenesis, and nerve repositioning, are performed in areas with deficient alveolar ridge in order to place a standard implant. These are time consuming and costly procedures. With the introduction of short implants, the procedures have become limited and less invasive. Custom implants have also been introduced which would be unique to each individual. In the present study, it was seen that the majority of the students were aware of the advances in dental implantology.

Guided implant surgery has enabled clinicians to transfer the planned rehabilitation for the patient directly into the surgical field. There are surgical guides and computer guided navigation systems that aid in the correct positioning and angulation of the implants during placement. They will help in attaining optimum primary stability of the implant. These methods allow the clinician to follow a very minimally invasive procedure and further retain the remaining natural structures. (van Steenberghe et al., 2005). In the present study, the majority of the students were aware of the term guided implant surgery, its uses and advantages during implant placement.

With the advances in radiographic diagnostic methods, it is now possible to plan treatments that are minimally invasive and make sure to take care of important anatomical landmarks. With CBCT and CT x-rays, clinicians can accurately measure the length and width of the available bone and make sure no nerves and vessels are in the way of the placement. (Marlière et al., 2018)The quality of the bone can also be assessed, further improving the chances of a successful implant. The present survey shows that students were aware of the radiographic and surgical means of providing a good implant placement.

The requirements for doing a guided implant surgery would include a Radiographic template, CT scan procedure, 3D computer simulation and Fabrication of templates. (Ramasamy et al., 2013) In the present study, it was seen that the students were aware that planning an implant procedure would require aids such as x-rays and templates. Dental implants require osteotomy drills, templates, bone grafts, anchoring pins, radiographs, etc in order to place it precisely in the bone. (Umapathy et al., 2015) The present survey conducted stated that quite a few students were not aware of all the necessary equipment that was required in implant dentistry. Our institution is passionate about high quality evidence based research and has excelled in various fields ( (Pc, Marimuthu and Devadoss, 2018; Ramesh et al., 2018; Vijayashree Priyadharsini, Smiline Girija and Paramasivam, 2018; Ezhilarasan, Apoorva and Ashok Vardhan, 2019; Ramadurai et al., 2019; Sridharan et al., 2019; Vijayashree Priyadharsini, 2019; Chandrasekar et al., 2020; Mathew et al., 2020; R et al., 2020; Samuel, 2021)

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#### **CONFLICT OF INTEREST**

No potential conflict of interest relevant to this article was reported.

## CONCLUSION

From the study, it was seen that the majority of the students were well aware of the various aspects of guided implant surgery.

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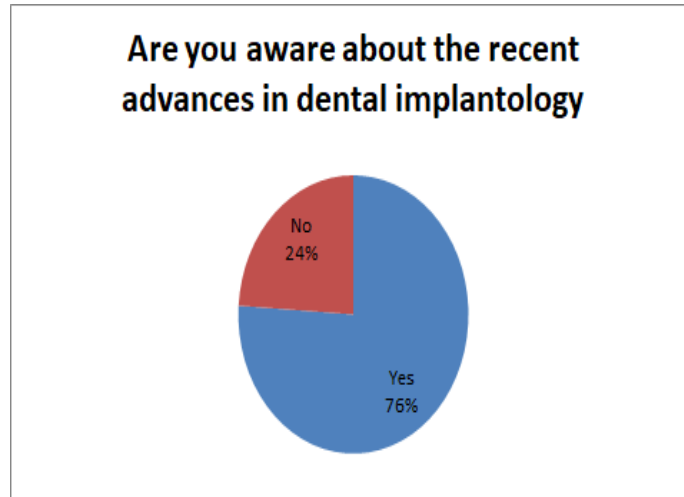
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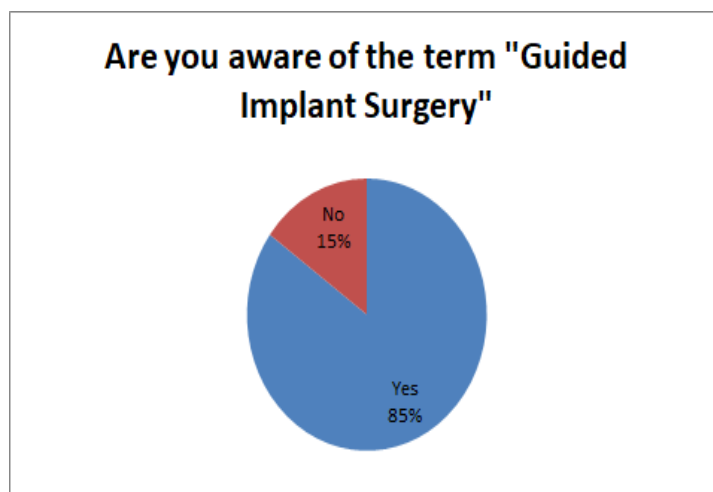
**Table 1: Shows the results from the survey.**

	Yes	No
Are you aware about the recent advances in dental implantology	76	24
Are you aware of the term "Guided Implant Surgery"	85	15
Do you think that guided implant surgery would aid in the success of dental implants	97	3
Do you think that guided implant surgery is a more precise and accurate procedure for placing implants	96	4
Do you think that guided implant surgery helps in the preservation of	96	4

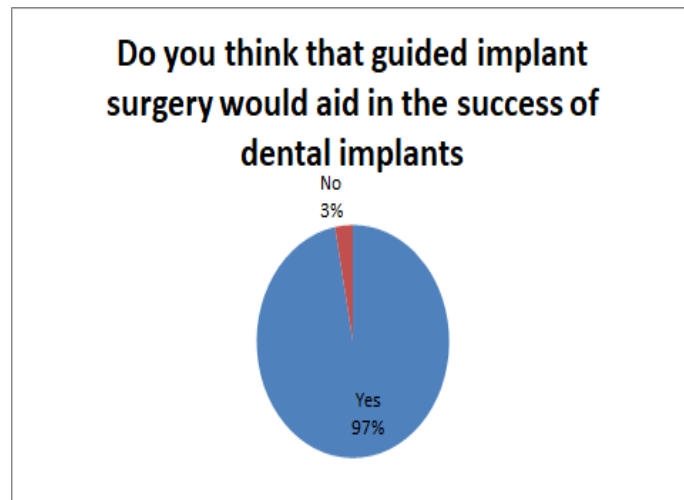
anatomical structures		
Do you think that guided implant surgery requires the surgeon to invest in a specialised surgical kit and planning software?	54	46
Do you think guided implant surgery can be performed in cases where there is decreased bone volume?	68	32
Are you aware that the special drill kit consists of tissue punch, drill sleeve and drills of various lengths	33	67



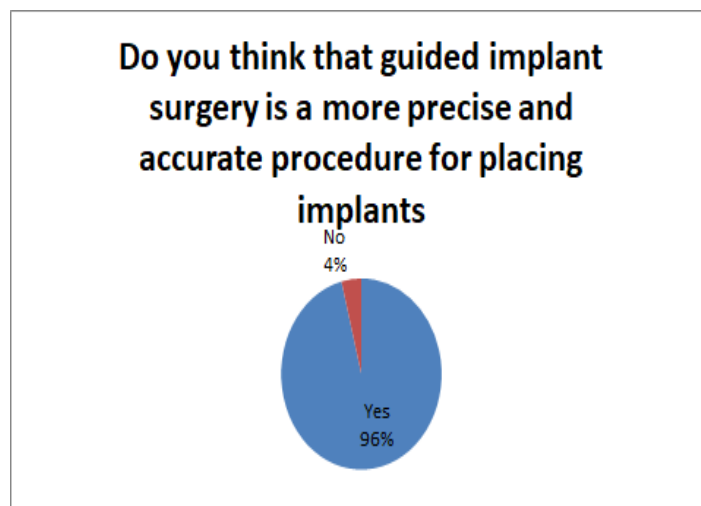
**Fig.1:** Pie chart shows the awareness of recent advances in implantology. Blue colour showed 76% of the students were aware and red colour stated that 24% of the students were not aware.



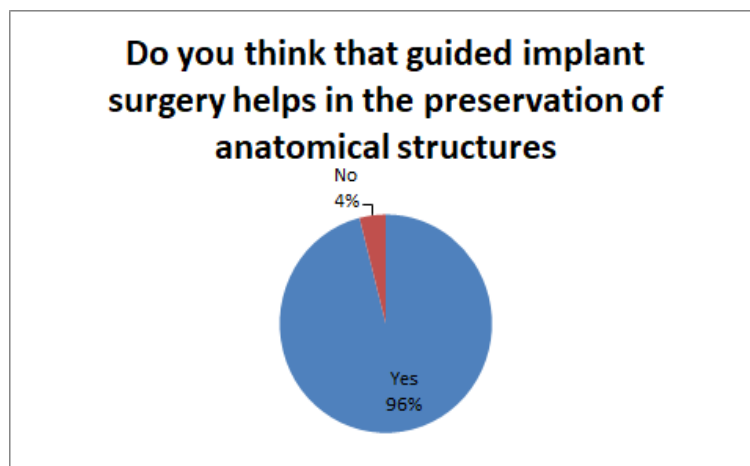
**Fig.2:** Pie chart shows the awareness of guided implant surgery. Blue colour showed that 85% of the students were aware of the term and red colour stated that 15% of the students were not aware.



**Fig.3:** Pie chart shows the response to whether the students were aware how guided implant surgery aided in implant placement. Blue colour stated that 97% of the students knew of its uses and the remaining 3% were not sure (red)

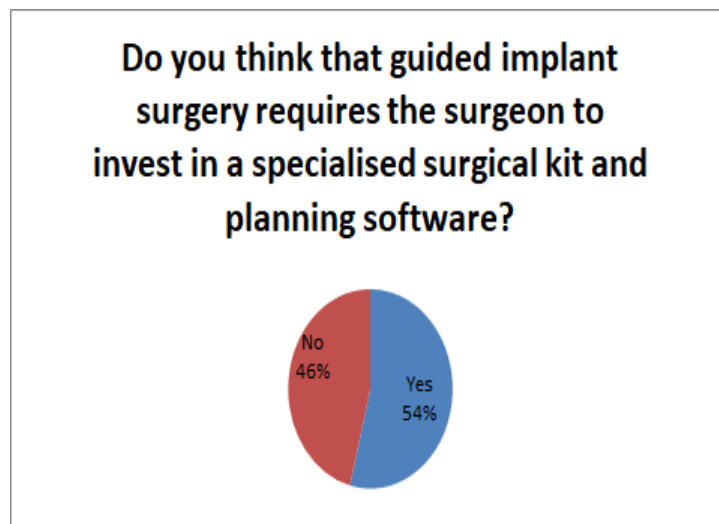


**Fig.4:** Pie chart shows the awareness of guided implant surgery and its use in the precise and accurate placement of dental implants. Blue colour stated that 96% of the students were aware of its use and red colour stated that 4% were not aware.

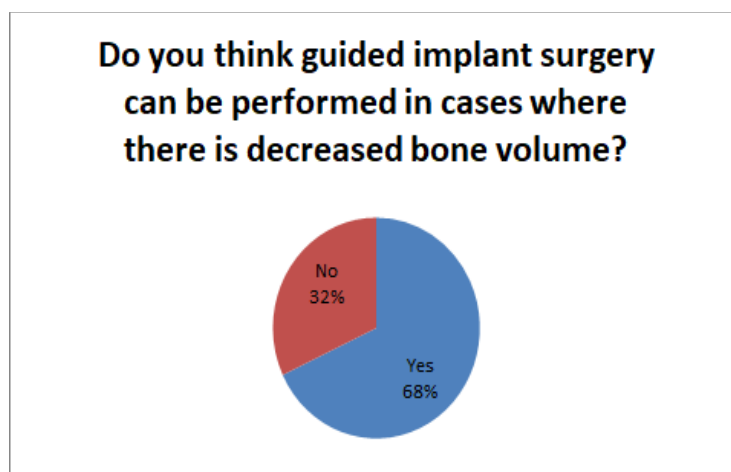


**Fig.5:** Pie chart shows the response for whether the students were aware of the aid of guided implant surgeries in the preservation of anatomical landmarks. Blue colour showed that 96% of the students were aware and red colour stated that 4% of the students were not.

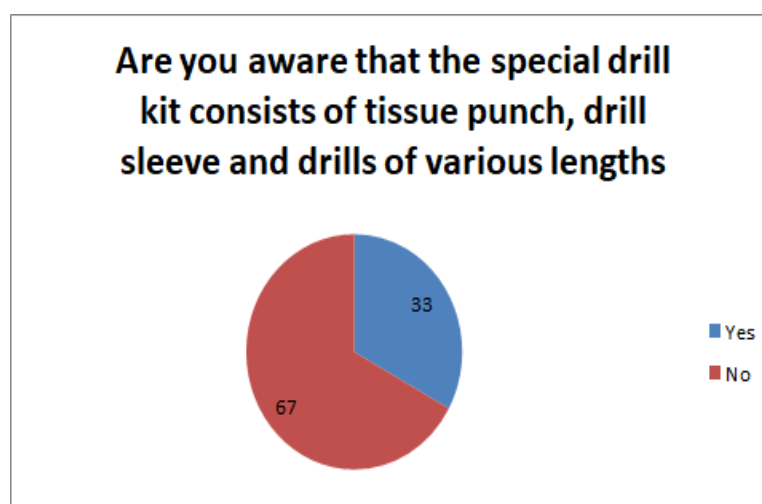




**Fig.6:** Pie chart states that 54% of the students knew that guided implant surgeries required a specialised surgical kit and planning software (blue). The remaining 46% (red) were unsure of it.



**Fig.7:** Pie chart stated that 68% of the students stated that guided implant surgeries can aid in the placement of dental implants in case of decreased bone volume (blue). The remaining 32% (red) were not sure.



**Fig.8:** Pie chart states that 33% of the students were aware that implant placement would require specific drill and equipment (blue). The remaining 67% (red) were not aware.