

Knowledge and Attitude about Cone Beam Computed Tomography (CBCT) among Dental Interns

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ABSTRACT

Aim: The aim of the present study was to assess the knowledge about Cone Beam Computed Tomography (CBCT) among dental interns.

Materials and Methods: It was a questionnaire based study in which a self-made questionnaire comprising of sixteen, close ended questions was used. The questionnaire was validated by scientific review board, ethical committee of concerned institution and two senior oral radiologists of the institution. The participants were given required time to mark the appropriate answers and data was subject to statistical analysis.

Results: The results concluded that majority of interns were aware about digital imaging and CBCT being an imaging modality in maxillofacial imaging. When questioned about source of knowledge about CBCT, majority of them revealed it to be the faculty lessons. They were also questioned about reason for preference of CBCT over two dimensional conventional imaging modalities and the response was found to be inappropriate for majority of them. Questions about basic mechanism used in CBCT imaging and use of CBCT for TMJ imaging were also asked, for which the response was found to be inappropriate. Few attitude based questions were also asked pertaining to include CBCT in future career and its different applications for which we got a positive response in majority.

Conclusion: The study revealed that dental interns had inadequate knowledge about CBCT. When superficial and basic questions were asked the response was good but when asked in depth, the knowledge was inadequate. Moreover, the attitude about use of CBCT in their future professional career was found to be positive.

INTRODUCTION

Cone-beam Computed Tomography (CBCT) is most significant technologic advance in maxillofacial imaging. CBCT uses a divergent cone-shaped or pyramid shaped source of ionizing radiation and a two dimensional area detector fixed on a rotating gantry to provide multiple sequential transmission images that are integrated directly forming volumetric or three dimensional information. The introduction of CBCT imaging has heralded a shift from 2D to volumetric approach in maxillofacial imaging^[1].

CBCT scanners function by directing a cone shaped X-ray beam on two dimensional (2D) sensor that revolves nearly 360 degrees around patients' head to yield a sequence of 2D images. A cone beam algorithm is done on this data set, permitting the operator to extract multiplanar reconstructions of variable thickness in any plane and to produce precise three dimensional (3D) images of bones and soft tissues [2].

CBCT has numerous significant applications in almost all areas of dentistry. To name a few these indications include, implant dentistry, evaluation of jaws for cysts and tumors, orthodontics, TMJ examination, paranasal sinus examination, assessment of impacted teeth, trauma cases, endodontics etc. [3].

Dental students being the future dentists should be well acquainted with the modern digitized radiological techniques including CBCT. Taking into consideration the increased implication of CBCT in dentistry, it appeared that the assessment of dental students' awareness for CBCT is essential. For this reason, dental interns who had recently finished their undergraduate course were questioned to assess their level of knowledge and their attitude about implication of CBCT in future dentistry.

LITERATURE REVIEW

A study was conducted to determine the knowledge and attitude of dentists towards CBCT in Mangalore, to assess the awareness of CBCT among dentists. A self-administered questionnaire of 23 multiple choice questions was given to dentists working in and around Mangalore. It was found that all the participants of the survey were aware of CBCT and considered it to be useful diagnostic tool in dentistry. The study also highlighted that majority of participants believed CBCT as the ultimate diagnostic tool in dentistry and research [4,5].

Another cross sectional type of questionnaire based study was conducted in Mumbai and Navi Mumbai, to assess the knowledge, attitude and practice of dentists regarding CBCT. It was concluded that the respondents displayed inadequate knowledge and awareness regarding CBCT and majority did not use this technology to its greatest potential in their day to day practice [6].

An observational questionnaire based cross sectional type of study was conducted in undergraduate and postgraduate students to assess the knowledge and attitude of dental students about CBCT. A pre prepared questionnaire having 15 questions was used to assemble the information. The study showed that most of the students were aware about CBCT and their responses reflected that they are aware of need of CBCT in dental field [7].

A study was carried out among final year BDS students and interns aimed at determining the knowledge and awareness of dental students and interns about CBCT. A close ended questionnaire comprising of 15 questions was used to assemble the information. The study showed that there was better awareness of CBCT among the final year students and interns. The information from study highlighted the need of CBCT for implant placement. The study also suggests the need of more awareness about this emerging new technology for better diagnosis and treatment planning [8].

Another questionnaire based study to assess the knowledge and attitude of dental students regarding CBCT. A questionnaire comprising of 11 questions was used to collect information. The study found that almost all the students had heard about CBCT and expressed the need of CBCT usage to be widespread in future. It was concluded that students should be provided with thorough practical knowledge and efforts should be made to improve their concepts regarding CBCT [9].

MATERIALS AND METHODS

A questionnaire based, cross section type of study was conducted in department of Oral Medicine and Radiology, Yenepoya dental college, Mangalore Karnataka. The study was aimed to assess knowledge and attitude about Cone Beam Computed Tomography (CBCT) among dental interns of the same institution. A self-made questionnaire comprising of 14 close ended questions regarding basic knowledge of CBCT and attitude of dental interns regarding use of CBCT in their future professional career, was formulated. The questionnaire was approved by Scientific Review Board and Ethical committee of the institution. The questionnaire was also validated by two senior oral radiologists of the institution for relevance of the questions to be asked. Dental interns who were undergoing training in our institution at the time of study were included in the study, while as the interns who had completed internship; undergraduate and postgraduate students were excluded from study. On the basis of convenience sampling method, a minimum sample size of 94 was found to be statistically significant using G* software. After taking proper informed consent from the participants, the questionnaire was distributed among 94 interns and they were given required time to mark the appropriate answers. All the interns marked all the questions and returned the questionnaire form. After collection, the data was entered in Excel sheets and was subject to statistical analysis. Descriptive statistics was used to calculate frequency and percentages using SPSS Software version 22.

RESULTS AND OBSERVATIONS

It is found from the study that there are significant number of participants who have insignificant knowledge about CBCT (Tables 1-14).

Table 1. The use of cone beam computed tomography in dento-maxillofacial imaging.

Q1	Frequency	Percent
Yes	91	95.2
No	3	4.8
Total	94	100

Table 2. The source of information about CBCT.

	Frequency	Percent
Faculty lessons	82	87.2
Seminars	4	4.3
Internet	3	3.2
others	5	5.3
Total	94	100

Table 3. Which radiographic technique is digital and record tissues in three dimensions.

	Frequency	Percent	Valid Percent	Cumulative Percent
Orthopantomogram	11	11.7	11.7	11.7
Lateral Cephalogram	7	7.4	7.4	19.1
CBCT	67	71.3	71.3	90.4
I do not know	9	9.6	9.6	100
Total	94	100	100	

Table 4. CBCT machine also record soft tissues.

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	57	60.6	60.6	60.6
No	15	16	16	76.6
I don't know	22	23.4	23.4	100
Total	94	100	100	

Table 5. The mechanism of action of a CBCT machine.

	Frequency	Percent	Valid Percent	Cumulative Percent
Virtual slices of scanned region	49	52.1	52.1	52.1
Divergent X-rays forming a cone, images reconstructed digitally	11	11.7	11.7	63.8
X-rays directed perpendicular to long axis of objects to be scanned	28	29.8	29.8	93.6
Total	94	100	100	

Table 6. Whether CBCT is more effective than orthopantomogram in detecting pathologies of the jaw.

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	31	33	33	33
No	28	29.8	29.8	62.8
May be	8	8.5	8.5	71.3
I don't know	27	28.7	28.7	100
Total	94	100	100	

Table 7. Will you use CBCT in your future professional career.

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	52	55.3	55.3	55.3
No	9	9.6	9.6	64.9
May be	20	21.3	21.3	86.2
Not decided	13	13.8	13.8	100
Total	94	100	100	

Table 8. Indication for CBCT used in your future professional career.

	Frequency	Percent	Valid Percent	Cumulative Percent
Implant dentistry	6	6.4	6.4	6.4
Assessment of impacted teeth	1	1.1	1.1	7.4
Evaluation of cysts and tumors	21	22.3	22.3	29.8
Orthodontic assessment	2	2.1	2.1	31.9
All of the above	64	68.1	68.1	100
Total	94	100	100	

Table 9. Is CBCT used for imaging TMJ disorders.

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	6	6.4	6.4	6.4
No	1	1.1	1.1	7.4
May be	21	22.3	22.3	29.8
I Don't know	2	2.1	2.1	31.9
Total	64	68.1	68.1	100

Table 10. Reason for CBCT used over CT as an imaging technique in head and neck region.

	Frequency	Percent	Valid Percent	Cumulative Percent
Radiation dose is less	28	29.8	29.8	29.8

Short time taken	8	8.5	8.5	38.3
Less expensive	30	31.9	31.9	70.2
Better resolution	9	9.6	9.6	79.8
All of the above	19	20.2	20.2	100
Total	94	100	100	

Table 11. Is it better to advise CBCT as compared to multiple 2-D radiographs in terms of radiation exposure.

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	36	38.3	38.3	38.3
In some cases	42	44.7	44.7	83
No	16	17	17	100
Total	94	100	100	

Table 12. Do you feel CBCT should to be available at your specialty.

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	48	51.1	51.1	51.1
No	22	23.4	23.4	73.4
No idea	24	25.5	25.5	98.9
				100
Total	94	100	100	

Table 13. Dental education, lectures on CBCT should be included in curriculum.

	Frequency	Percent	Valid Percent	Cumulative Percent
First year	7	7.4	7.4	7.4
Second year	8	8.5	8.5	16
Third year	37	39.4	39.4	55.3
Final year	42	44.7	44.7	100
Total	94	100	100	

Table 14. Is there need of Frequent CDE/workshops conducted to acquire more knowledge about CBCT.

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	55	58.5	58.5	58.5
No	19	20.2	20.2	78.7
No idea	8	8.5	8.5	87.2
May be	12	12.8	12.8	100
Total	94	100	100	

DISCUSSION

Cone Beam Computed Tomographic (CBCT) imaging is the most significant technologic advance in maxillofacial imaging since the introduction of panoramic radiography. CBCT imaging was initially developed commercially for angiography in early 1980s. It uses a divergent cone-shaped or pyramid shaped source of ionizing radiation and a two dimensional area detector fixed on a rotating gantry to provide multiple sequential transmission images that are integrated directly, forming volumetric information. In the early 1990s four technologic developments converged to facilitate construction of affordable CBCT units small enough to be used in dental office for maxillofacial imaging. These developments are introduction of x-ray detectors capable of rapid acquisition of multiple basis images, development of suitably high-output x-ray generators, evolution of suitable image acquisition and integration algorithms and availability of inexpensive computers powerful enough to process the enormous amount of acquired image data. The time taken for scanning as well as dose of radiation for CBCT is lesser than that for Computed Tomography (CT) [10].

CBCT finds application in multiple aspects of maxillofacial diagnosis and hence aids in proper treatment planning but it is found that little is known about its principle, applications and necessity of its use in maxillofacial imaging by students at their undergraduate level or in the course of internship. In order to assess the level of basic knowledge about principle and applications of CBCT as well as their attitude about the use of this advanced imaging modality, who had freshly completed their undergraduate course, a study was conducted in Yenepoya Dental College Mangalore in which 94 interns were contacted and all of them gave their consent and participated in the study.

The questions asked were aimed to explore the basic knowledge about digital imaging techniques, three dimensional imaging, advantages of three dimensional over two dimensional imaging, the reason for choosing CBCT over CT, the primary applications of CBCT in maxillofacial imaging, the efficacy of CBCT in diagnosing pathologies of jaws when compared to 2D imaging modalities etc. While as some questions were formulated to know the attitude of interns about importance and use of CBCT in their future career and to explore their attitude about inclusion of CBCT based curricular activities and workshops in undergraduate training course.

Our study showed that majority of interns knows about digital mode of imaging and about CBCT as an imaging modality in oral and maxillofacial region. But there is need of providing adequate knowledge about principle used in CBCT based imaging as well as the reason for preference of CBCT over CT in maxillofacial imaging. The results are in concordance with the study carried out in undergraduate students by Palak et al. [9] the results are in discordance with the study carried out in Navi Mumbai, on post graduate students. The reason for discordance can be attributed to the difference in level of professional career and hence difference in knowledge, as our study was carried out in interns and their study was carried out in post graduates. In our study it was found that majority of participants felt the need of use of CBCT in their future professional career. This is in accordance with the results of a study carried out among dentists in and around Mangalore, in which dentists have shown the ultimate need of CBCT to be used in dental profession [5].

In our study it was found that interns have a better knowledge about reason for preference of CBCT over 2-D imaging in diagnosing pathologies of jaws and about the application of CBCT in imaging TMJ disorders. It was evident from our study that majority of the interns mentioned that they will be using CBCT in their future clinical practice which is in concordance with the results of study carried out by Roshene et al. [8] in interns and final year students. The response of the interns to which branch is CBCT preferably to be used was primarily in implantology followed by its use in detection of cysts and tumors. This depicts the clarity about usefulness of this tool for advanced procedures. This result was in accordance with the study carried out by Roshene et al. [8] and in the same study it has been found that interns did not have better clarity about scope of applications of CBCT in diagnosing TMJ disorders in which majority of them responded that it cannot be used in diagnosing TMJ disorders, which is again in accordance to results of our study. In our study majority of interns suggested that there is need of more frequent workshops and CDE programs to be conducted for better understanding of CBCT and the lectures about CBCT should be included in curriculum in final year of BDS course. Majority of the interns when questioned about the mechanism of action of CBCT mentioned that it is based on virtual slice formation of scanned region while as second common answer to this question was that it includes the use of divergent beam of x-ray in a cone shape. Moreover only 51% of respondents mentioned that there is need for CBCT in their specialty. This result also depicts the inadequate knowledge about importance of CBCT as an advanced imaging modality.

CONCLUSION

This study was carried out in a Dental institution with CBCT facility. It is found from the study that there are significant number of participants who have insignificant knowledge about CBCT. The outcome of study also depicted that when analyzed in depth the knowledge was inadequate while as response was good when superficial basic questions were asked. The lack of practical exposure to CBCT can be attributed to the fact that students are not being exposed to

sufficient curricular activities about CBCT like Workshops, CDE programs, quiz competitions, Audio/video and interactive sessions along with the practical demonstration about the procedure. The deficiency can also be attributed to the fact that Dental Council of India has not made it mandatory to include CBCT based curricular activities to be included in undergraduate level of dentistry.

RECOMMENDATIONS

Authors of this study would like to recommend:

1. To introduce the radiographic advances in dental curriculum at an earliest level at undergraduate level.
2. To conduct interactive sessions or workshops with practical demonstration about CBCT during the course of internship.
3. To make certified courses necessary about CBCT by DCI.
4. More studies to be carried out among undergraduate students, post graduate students, faculty and general dental practitioners regarding assessment of knowledge about CBCT and necessary modifications to be made depending upon the results.

LIMITATIONS OF THE STUDY

Participants of the study included interns of a single institution.

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