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## Original Research Article

# Virtual online teaching in lieu of cadaveric dissection and traditional learning methods during Anatomy classes in the lockdown times of COVID–19: Students perspective

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## ABSTRACT

**Background:** Dissecting a cadaver is a once in a lifetime opportunity for a medical student. But considering the present COVID -19 pandemic, most of the medical colleges have stopped the cadaveric dissections and other offline teaching activities since March 2020. Virtual online classes on Zoom® meetings and Google® classroom were taken.

**Aims and Objective:** This study is done to find the viewpoint of 1<sup>st</sup> MBBS students to use of virtual online teaching in lieu of cadaveric dissection and traditional teaching methods.

**Materials and Methods:** Pretested questionnaires were sent to willing students. A consent form was first sent followed by first questionnaire during the online classes in August 2020. Second questionnaire was sent after offline classes in small groups were taken in December 2020.

**Results:** Online histology classes were preferred by 49.7% students. Osteology tutorials and classroom lectures of gross Anatomy were preferred over virtual classes. Students preferred recorded lecture to live online lecture because of connectivity issues.

**Conclusion:** Online classes helped in continuation of classes during pandemic. But online lectures and virtual dissection can't replace classroom lectures and cadaveric dissection.

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## 1. Introduction

“After I die if I am buried, I will rot. If I am burnt I will become ash but if my body is donated I will live to give life and happiness to many.” Famous psychologist Abraham finds the quintessence of life with this quote.<sup>1</sup>

The cadaver is considered the first teacher for Medical students.<sup>2</sup> The cadaver is considered the first teacher for Medical students.<sup>2</sup> Dissecting a human cadaver is a once in the lifetime opportunity thus becoming an indispensable learning tool in Medical education. This 3D view point forms the core of Anatomy learning process for every 1st year M.B.B.S. student.<sup>3</sup> As per Evans and Pawlina,<sup>4</sup> a

whole range of nontraditional discipline independent skills [NTDS] are learnt by students during interaction with anatomy staff and cadaveric dissection.

However, considering the COVID-19 pandemic situation from March 2020 most of the cadaveric dissection time was lost for the 1st M.B.B.S. students due to lockdown declared by civic administration.

Absence of dissection from anatomy teaching due to COVID-19 will leave a lasting impact on the students. Missing direct and face to face interaction with dissection tablemates and teachers will potentially hamper the overall development of 1st year students.<sup>5</sup>

Though online teaching helps in Anatomy teaching during this COVID pandemic, but cadaveric dissection is

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considered the most effective learning tool.<sup>6</sup>

Gregory and Cole<sup>7</sup> mention that adjusting to online teaching was not an easy task, both for students and teachers. Student can't appreciate the fabric of human body by just accessing an online human body atlas. Pictures don't give the feel of tissues.

Future of cadaveric dissection is in question for the near future considering the stoppage of majority of cadaveric body donation schemes.<sup>8</sup> Finegan O et al<sup>9</sup> state that this COVID -19 pandemic can lead to severe shortage of cadavers for upcoming batches causing significant change in modality and quality of medical education.

Academic syllabus was completed for the year by taking online lecture and virtual practical classes, but the three dimensional view of dissecting yourself and feeling the organs and bones was missing.

Once the students returned to the institute from 1<sup>st</sup> December 2020 sessions were conducted with prosected cadaveric specimens, bones and histology slides in small groups. All necessary universal precautions of sanitization and social distancing were maintained. Traditional teaching was taken before the pandemic followed by virtual teaching on Zoom<sup>®</sup> meetings, Google<sup>®</sup> classroom and Google<sup>®</sup> meet applications during the outbreak. Post the resumption of classes, small group sessions with prosected cadaveric specimen, bones and histology slides were taken. Revision classes for theory were taken online on Zoom meetings and as recorded lectures on Google classroom, thus making it a hybrid or blended session with both online and offline education. The current study was undertaken to determine the attitude and reaction of 1<sup>st</sup> year students to this use of virtual online teaching in lieu of cadaveric dissection and traditional teaching methods.

## 2. Materials and Methods

This questionnaire based study with 1<sup>st</sup> MBBS students was done to find the responses to Online teaching in lieu of cadaveric dissection and traditional teaching methods. Ethical clearance for the study was given by Ethical committee of Dr. D.Y. Patil Vidyapeeth.

### 2.1. Study design

It is a questionnaire based longitudinal Survey. Only willing students participated in this questionnaire based study. An informed consent form was first sent to the candidates. A photograph of the filled and signed consent form was mailed by the students. Standardized and pretested questionnaires prepared in English were sent to the email IDs of all participants.

1<sup>st</sup> questionnaire was sent by e-mail during the online lectures and gross, osteology and histology online practical classes in August 2020.

The 2nd questionnaire was sent after the prosected cadaveric specimens, osteology bones and histology slides were shown in practical class after resumption of classes in December 2020. The questionnaires are shown in Table 1. All standardized universal precautions were maintained during the offline practical classes.

**Table 1: Questionnaires 1 & 2**

Questionnaire 1		Questionnaire 2	
S.No	Question	S.No	Question
1	You got better comprehension of soft parts in online classes	1	You got better comprehension of softs part in prosection classes
2	You get better understanding of osteology in online classes	2	You got better understanding of osteology during offline tutorials
3	You get better comprehension of histology slides during online classes	3	You got better comprehension of histology slides during offline practicals
4	Use of videos helped in better interpretations of the topics	4	Virtual anatomy dissection can replace cadaveric dissection
5	Prerecorded lectures were better than live online lectures	5	Face to face interaction between student and teacher is beneficial for Anatomy learning.
6	Difficulty encountered during online classes	6	Online lecture is better than classroom lectures

Responses given were a] Strongly Agree, b] Agree, c] Neutral, d] Disagree and e] Strongly Disagree. Responses for Q.no 6 Questionnaire 1 are given in Table 2.

## 3. Aims and Objectives

To study the attitude of 1<sup>st</sup> year medical students towards use of dissection videos, gross and osteology images and histology photographs instead of cadaveric dissection, osteology tutorials and histology slides during times of COVID-19.

1. During online lecture and virtual practical classes.
2. After offline classes in the college with prosected cadaveric specimens, bones and histology slides.

The relevant data obtained from questionnaires was tabulated and analyzed statistically.

## 4. Results and Observation

The student responses to the Questionnaires 1 and 2 shown in Table 1 were analyzed and inferences drawn.

Students were asked if online gross anatomy classes helped to get proper comprehension of soft parts during the online classes and after prosection classes. During online classes 43% strongly disagreed while 28.9% disagreed about getting proper interpretation. After prosection classes 61.9% strongly agreed and 21.9% agreed about getting proper interpretation of soft part. Only 1.9% disagreed while 2% strongly disagreed with this. Thus, sessions with prosected specimen helped students get better comprehension from exam point of view. The results are shown as Figure 1.

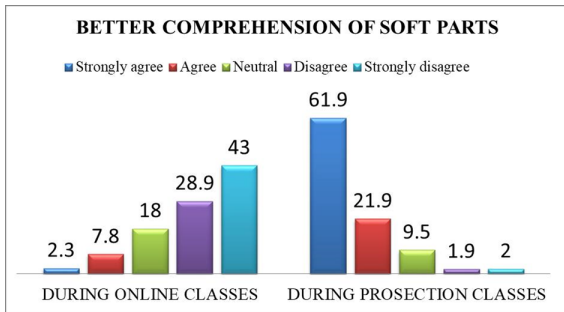


Fig. 1: Questionnaire 1 & 2, Q no.1 - You got better comprehension of soft parts

For a query if they got proper understanding of osteology from online classes, only 2% strongly agreed and 5.1% agreed about it. 20.7% Disagreed and 64.1% strongly disagreed with it. When asked after offline osteology tutorials on resumption of classes, 65.7% strongly agreed and 25.7% agreed of getting proper understanding of bones. So offline osteology tutorials were considered beneficial by the participants. Results are shown as Figure 2.

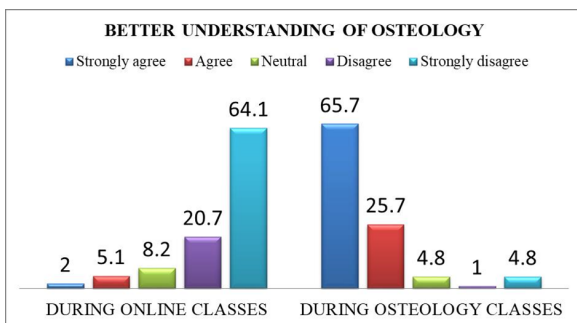


Fig. 2: Questionnaire 1 & 2, Q no. 2 You got better understanding of osteology

A question was asked about better comprehension of histology from online classes and after histology practical on resumption of classes in histology laboratory. 10.2% strongly agreed and 39.5% agreed of getting proper comprehension of histology from online classes. After resumption of histology classes in histology laboratory 59% strongly agreed and 30.5% agreed about getting proper

interpretation. So we say 49.7% students felt that virtual histology classes were useful for histology. 89.5% felt that focusing the slides yourself on microscope gave them a better comprehension. These results are shown as Figure 3.

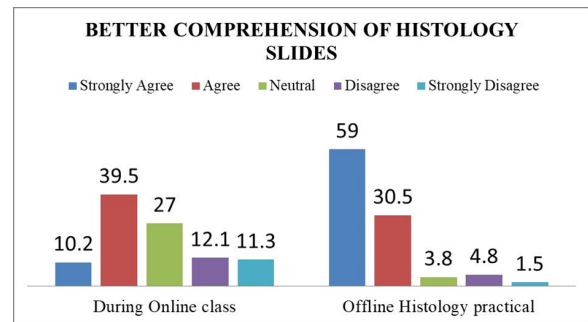


Fig. 3: Questionnaire 1 & 2, Q no. 3 You got better comprehension of histology

When asked if online lecture was better than classroom lectures, Only 3% strongly agreed and 4% agreed with it. 20% disagreed and 63% strongly disagreed with this statement. So classroom lectures were preferred to virtual lectures. The results are shown in Figure 4.

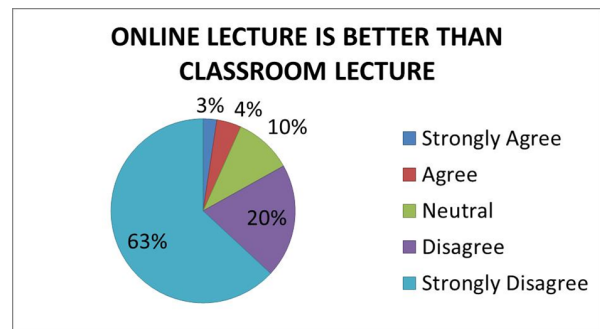


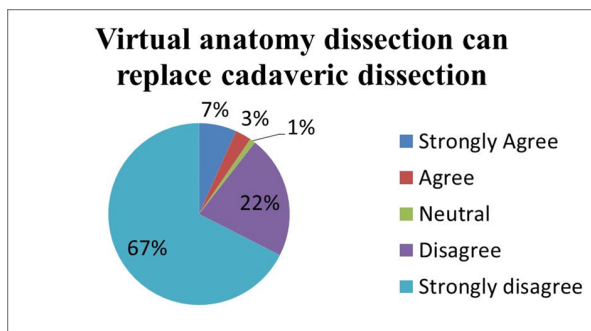
Fig. 4: Questionnaire 2, Q no. 6 Online lecture is better than classroom lecture

When questioned if virtual dissection can replace cadaveric dissection, 7% strongly agreed and 3% agreed to this point. 22% disagreed and 67% strongly disagreed, thus voting cadaveric dissection above virtual dissection. The results are shown in Figure 5.

76.2% strongly agreed and 17.1% agreed that face to face student and teacher interaction was necessary for Anatomy teaching. 2.9% were neutral to this and only 3.8% disagreed to this point.

Use of videos during online lecture classes was liked by maximum participants. 5.4% strongly agreed and 40.5% agreed that use of videos helped in Anatomy classes. 33.9% were neutral to it. Only 7% disagreed and 13.2% strongly disagreed to use of videos helping in interpretation of topic.

Problems encountered during online classes are shown in Table 2. The most common problem was network



**Fig. 5:** Questionnaire 2. Q no. 5 Virtual anatomy dissection can replace cadaveric anatomy dissection

issues causing disruption of online lectures [36%]. The connectivity issue was seen both from student or participant and teacher or host side. Books and bone sets stranded in hostel was reported by 17%. 27% said the teachers and student are not friendly with using learning management system. 20% quoted the distractions at home causing difficulty in online learning.

57% students preferred prerecorded lectures over live online lectures on Zoom® meetings. Advantages of recorded lectures over live virtual classes are as follows -

1. A recorded lecture can be revised again and again, anytime, anywhere.
2. No problems like losing connectivity and audio-video disruptions.
3. No time bound learning.
4. More scope for self-learning.
5. Independent access to the topic and teacher.

**Table 2:** Difficulties encountered by students during online classes [Q.No 6 Questionnaire 1]

S. No	Difficulty	Percentage [%]
1	Network problems causing audio and video problems.	36%
2	Lack of books and bone sets.	17%
3	Unfriendliness with LMS applications.	27%
4	Distractions at home.	20%

## 5. Discussion

We found that the online classes were vital in continuing the teaching activities during lockdown. Teachers overcame time constraints to arrange resources and lecture presentations for conduct of virtual classes with online platforms. This stopgap arrangement can assist traditional teaching but can't replace it.

"The first silent teacher" for any medical student is always the cadaver. Dissecting a cadaver gives a feeling

of gratitude and various skills like getting oriented to the various dissection instruments and soft parts like fascia, muscle and nerves. Some virtues like team building, cleanliness and responsibility are learnt at the dissection table.<sup>2</sup> In a study on reaction of 1st year MBBS students to Cadaveric dissection by Shinde et al,<sup>3</sup> a sense of gratitude to the cadaver increased from 93.08% in first week of dissection to 99.14% after eight weeks of cadaveric dissection. Interactions with Anatomy staff helps the first year student cope with stress of cadaveric dissection and academic curriculum.<sup>3</sup> As per O.A. Onigbinde<sup>2</sup> a shift from classroom and dissection hall education to virtual platform is caused due to the COVID -19 outbreaks. Consideration of safety of cadavers from possible SARS-COV-2 infection will decide the level of Anatomy education and cadaveric dissection in post COVID era.

Formalin fixed cadavers can be infected from infectious pathogens like Hepatitis B, TB and AIDS virus.<sup>10</sup> Demiryurek D<sup>10</sup> and Onigbinde<sup>11</sup> state that cadavers could still be infectious for the dissecting and embalming staff. Maintaining various universal precautions is required for safety from various infections like novel Corona virus. So stopping acceptance of voluntary donation of cadavers and using the earlier dissected soft parts for demonstration in small groups seems the solution during lockdown period.

Boecker and Boecker<sup>12</sup> conclude that this premature stoppage of dissection may leave the student with a sense of guilt that they did not finish the dissection. A feeling of losing an opportunity to thank the cadaver will surely be felt by students.

S Dost<sup>13</sup> states that online learning is beneficial for the students. Saving travel time, cutting cost and learning at own pace are some of the positives for online teaching. 75.99% students feel that virtual clinical classes are not effective. 82.17% students feel that online practical classes can't be conducted effectively. Various online teaching programs like BiteMedicine, Osmosis and Sustaining Medical Education in a Lockdown Environment [SMILE] have been innovated successfully to continue medical education during this pandemic. However, an increase in burnout rate can't be ruled out. Pre-recorded video tutorials were preferred over live tutorial sessions. Our study also showed preference for recorded lectures. Live sessions have the advantage of live question-answer session at the end of class but technical difficulties and internet problems make it less popular.

Pie and Wu<sup>14</sup> state that virtual teaching enhances the knowledge and skills of undergraduate Medical students. With Massive Open Online Courses [MOOC] bridging the gap between traditional and virtual learning, these courses are cost effective and student friendly. But an online course can't replace face to face interactions and skill based sessions between student and teacher.

Singh K et al<sup>15</sup> state that traditional cadaveric education in small groups forms the gold standard of Anatomy learning in this pandemic affected era. With decrease in cadaveric donations and social distancing guidelines in place, the Technology Enhanced Learning [TEL] is the accepted mode now. A hands on cadaveric sessions along with virtual classes will give a three dimensional view to Anatomy learning. This gives a lot of opportunities for the anatomy teaching staff to improve upon teaching and learning methods by using blended mode of learning. Adjustment to remote learning over face to face teaching makes a new dimension of teaching open for students and staff.

Iwanaga J et al<sup>16</sup> compares the various learning methods used for anatomy education. Strong preference of students was towards use of prosected specimens. Having prior knowledge of the topic before the prosection sessions, show increase in short-term retention. Use of Plastinated specimen was not preferred by students. Videos and online resources were used by many institutions for virtual classes. Anatomical details can be correlated effectively by using high quality 3D printed specimen. In Augmented Reality [AR] Virtual objects are Digitally superimposed onto physical objects in real space. Here the participant can interact with both the objects at the same time. The highlight of using AR is the representing an anatomical model in three dimensions and users sense of own environment is maintained. Comparing all these virtual modalities with cadaveric dissection, authors conclude that cadaveric dissections helps in better understanding of anatomical structure and function. Various skills like teamwork, ethics, self reflection and communication skills are learned on the dissection table. A blended approach using multiple learning methods is recommended.

This COVID 19 pandemic is writing a new episode in history of Anatomy education. Shifting a visual subject like Anatomy to virtual online mode of education can't be considered a silver bullet solution. Singhal A et al<sup>17</sup> conducted a questionnaire based study with 1st year students of AIIMS Bhatinda and Bhojia Dental College. Feedback was taken after 3 months of online classes. 65% students missed interaction with mentors, discussion with classmates, cadaveric dissection and face to face lectures. Regarding problems faced during online classes, 81% felt the lack of high bandwidth and strong internet connection was at fault. 80% opined that text books and study material stuck in the hostels affected online education from home. 9% students were completely dissatisfied with virtual classes. 88% liked the live dissection sessions while 58% preferred recorded sessions. 90% missed the campus environment with cultural and sports activities. 68% found lot of distractions at home, making time management difficult. These findings are complementary to our findings. They conclude that traditional education model will not be

obsolete in post COVID times but blended learning will be the norm henceforth.

In a study on online teaching of Anatomy in Soeul Korea, Yoo H et al<sup>18</sup> compared the batches of 2019 and 2020. The 2019 batch learned Anatomy the traditional way with didactic lectures, small group teaching and dissection. Blended learning was used for the 2020 batches that is online classes followed by some offline classes when COVID cases decreased in Korea. Academically the 2020 batch scored more than the other batch in assessment exams. In an online survey taken, 79% participants preferred virtual classes to offline lectures. While in our study only 7% students preferred online over classroom lectures for gross anatomy classes and 49.7% agreed that online histology classes gave them proper comprehension. In Korea the students responded that online classes provided them more time to which they could use towards self directed learning. Online recorded lectures were preferred by the participants for revision and better understanding.

John M R et al<sup>19</sup> reviewed the pros and cons of online teaching. The current situation has led to use of virtual platform for education. Anatomy staff is processing already available material and developing new resources. Pandemic brings newer opportunities like working with worldwide experts and using blended learning tools for the staff. 70% students preferred face to face didactic classes. 87.5% faced network issues during online class. The host server being down was reported by 37.5% students. 48.6% opine that online class should not replace regular classroom lectures. Reduced teacher - student interaction is the chief disadvantage of virtual education.

The COVID -19 outbreak led to stoppage of theory and practical histology classes. Darici D et al<sup>20</sup> implemented a digital Histology learning course. Online videoconferencing sessions were the preferred mode to allow live interactions between teacher and student. Study material comprising lecture slides and annotated histology images were sent to the students a day before and after the class. Students gave a positive response as feedback for the course. Even in our study 49.7% reported that they got proper interpretation of histology during online classes. The online histology course has potential for development in the future. Better resources and personal face to face interaction with staff will make histology learning better.

Stoppage of cadaveric dissection and body donation drive will cause a shortage of cadavers for Medical education for batches to come. Karkera S<sup>21</sup> considered the use of Cadaver less virtual dissection with use of Anatomage virtual dissection table. [AT] Interactive simulation and use of multimedia tools make virtual dissection a suitable learning tool. But only virtual teaching leads to low levels of understanding. A drawback of virtual dissection is considered that it prevents the student from getting a sense of feel and texture of the soft parts. The

tactile form of learning is lost. Anatomy teachers need to be properly trained in this module first before the classes. Proper use of virtual dissection table will lead to enhancement of Anatomy education. Cadaveric and virtual module will together fulfill the long term goals.

A problem faced by lot of experienced senior teachers has been adjusting to use of all these learning apps and gadgets. Many teachers are technophobic, they are more worried about using these devices in classroom. Newer learning methods like virtual and hybrid teaching and have surely worked as a blessing in removing this phobia.<sup>22</sup>

D Saverino<sup>23</sup> mentions that stimulation of long term memory development is a result of innovative teaching modalities during the pandemic. Anatomy is now active and interesting, not mnemonic and boring as earlier considered.

## 6. Conclusion

In these lockdown times of COVID -19, virtual education has helped in conducting the academic sessions to finish the remaining syllabus successfully. Students showed preference to the recorded lectures over online live classes. Subjects like gross anatomy and osteology required dissection hall prosection sessions and demonstration room tutorials for proper interpretation after online classes. Online Histology classes were highly appreciated by students. We conclude that online lectures and virtual dissection can't replace classroom lectures and cadaveric dissection. A hybrid pattern combining online teaching with traditional methods will succeed for medical education in these COVID times.

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## 8. Conflict of Interest

The authors declare no conflict of interest.

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