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ORIGINAL ARTICLE

IS 3D CYBER ANATOMY A PREFERABLE TEACHING METHOD?

Mahvish Javed, Nouman Rauf, Ayesha Khan, Maham Iftikhar, Fatima Haider, Sarem Jamil

Department of Anatomy, Khyber Girls Medical College

ABSTRACT

Background: Gross anatomy has been taught over the years by cadavers' dissection, plastic models and atlases. This study is aimed to compare conventional teaching methods of anatomy with that of 3D cyber anatomy.

Materials & Methods: This longitudinal cross-sectional study with prospective type was conducted in Khyber Girls Medical College Peshawar, having a sample size of 233 from three different colleges, using Open-Source Statistics for Public Health sample size calculator. Using random number generator 80 students were made to attempt a pretest and a post-test consisting of 20 MCQs prior to and after completion of GIT and Renal module respectively.

Results: Out of 585 students, 240 (80 from each medical college) students took part in the study with 144 female students. Mean age of the students was 20.7 +/-1.07 years. College 2 had highest post-test mean score. The mean difference of test scores between post-test and pre-test among all colleges were statically significant as calculated by paired sample T-test. There was significant difference in mean score of post-tests among 3 colleges which was find out by One-way ANOVA. Post hoc tests identified that post test scores of college 2 was statically different from college 1 and college 3. Our results also showed a significant difference in post-test scores between gender with female students scoring higher than male students.

Conclusion: There was no difference in academic performance between the students taught either by conventional method or 3D cyber anatomy and a better performance of female students as compared to male students was also noted.

KEY WORDS: Anatomy; cadavers; medical students; cross-sectional study.

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INTRODUCTION

With recent advancements in medical teaching in anatomy an intense need has been felt to enhance recognition of anatomical structures and their relations, aiming that students can use this knowledge successfully while performing procedures and diagnosis in their clinical settings.[1,2] Introduction of new medical curriculum and Integrated teaching methods the basic sciences need to be taught side by side with their clinical modalities.[3] Gross anatomy is an integral part of medical science which carry an immense importance for any health care professional and it is included as a major basic subject in the first two professional years of medicine.[4] Gross anatomy has been taught over the years by particular methods and appropriate learning tools like cadavers dissection and models.[5-7] These were all conventional methods of teaching anatomy still being used in almost all medical colleges.[8-10]

However, it has been observed by teaching faculty of clinical years that students are unable to recall anatomical relations and structures in long term and find it hard to memorize.[11,12] Also due to recent curricular modifications, ethical issues and lack of availability of cadavers, many medical colleges cannot arrange this learning tool for visual memorization.[13,14] Plastic/silicone models along with digital atlases are also efficient way of teaching anatomy in three dimensional perspective and constitute a hybrid model. Though detail and comprehensive versions of these are expensive so availability is again compromised.[15]

Introduction of cyber anatomy (3D anatomy) have

Corresponding Author:

Dr. Nouman Rauf
Lecturer , Department of Anatomy
Khyber Girls Medical College
Peshawar, Pakistan
E-mail: docnoumanrauf@gmail.com

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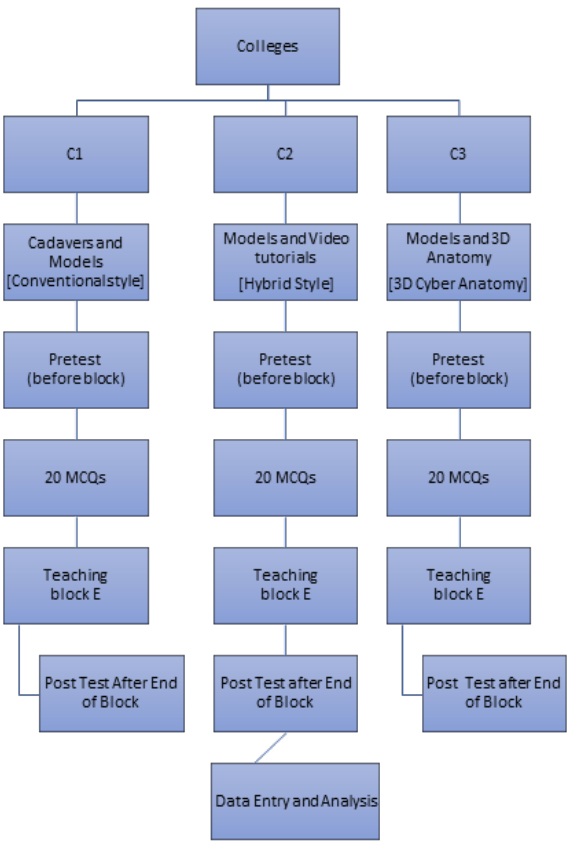
been considered recently more preferable over conventional styles.[16,17] This study was intended to compare the knowledge acquired through conventional teaching methods, hybrid method and 3D cyber anatomy.

MATERIAL AND METHODS

This longitudinal cross-sectional study was conducted from February 2023 to August 2023 in Khyber Girls Medical College Peshawar after we got the ethical approval from Hospital research and Ethical Committee via doc no HMC-QAD-F-00.



As shown in the above flow chart, the study area for the present research work were 3 medical colleges of Peshawar using different methods for teaching anatomy.

College 1 (C1): Dissection on cadavers plus available anatomy models [Conventional style]

College 2 (C2): Available models and video tutorials [Hybrid style]

College 3 (C3): Available models and 3D cyber anatomy facility [3D cyber anatomy]

Sample size was calculated using Open-Source Statistics for Public Health sample size calculator by taking population as 585 anticipated % frequency at 50, absolute precision of 5%. By keeping the confidence interval at 95% our sample size came out to be 233.

All medical students from second year MBBS of these three medical colleges of KP who were willing to take part in the study before the beginning of BLOCK E (GIT and Renal Module) was included in the study. Those students who were not willing to participate in the study, those who were preparing for foreign medical registration exams and those repeating the second year were excluded from the study.

We randomly selected 80 students using random number generator from each college and then conducted tests consisting of three sets of 20 multiple choice questions (MCQs) from GIT topics and each question was allotted one mark. 80 students of second year MBBS students from each medical college were made to attempt one set of 20 MCQs on two occasions i-e Pre-test i-e before start of GIT and Renal module, post-test i-e after completion of the module.

RESULTS

Out of 585 students, 240 (80 from each medical college) students took part in the study with 144 female students. Mean age of the students were 20.7 +/-1.07 years.

Fig 1.1 shows that College 2 has highest post-test mean score. The mean difference of test score between post-test and pre-test for C1=2.38 (skewness=0.097 & Kurtosis=-0.27), for C2=2.81 (skewness=-0.104 & Kurtosis=-0.518) and for C3=2.03 (skewness=0.153 & Kurtosis=-0.625). So accordingly paired sample T-Test was applied on pre-test and post-test scores of all colleges to find out the difference between scores. As shown in table 1.1, the p-values for all pairs are less than 0.05 showing that there is a statically significant difference in the results of pre-test and post-test.

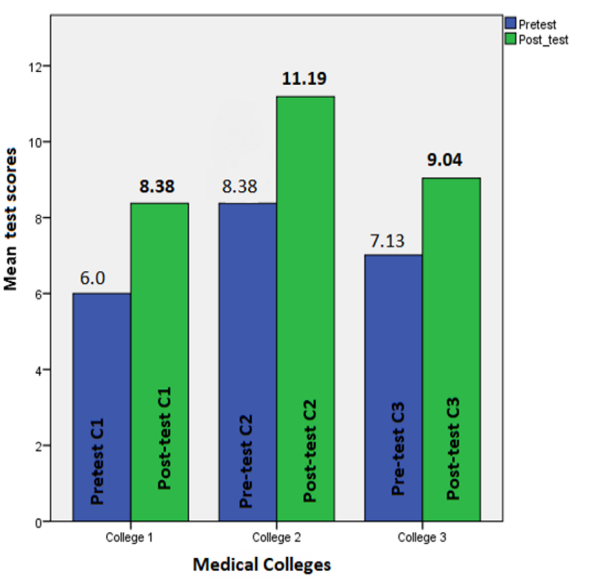


Figure 1.1

Table 1.1

Paired Samples Test									
		Paired Differences							
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper	t	df	Sig. (2-tailed)
Pair 1	C1_post_test - C1_pretest	2.375	2.659	.297	1.783	2.967	7.988	79	.000
Pair 2	C2_post_test - C2_pretest	2.813	4.343	.486	1.846	3.779	5.792	79	.000
Pair 3	C3_PostTestN - C3_pretest	2.025	2.810	.314	1.400	2.650	6.445	79	.000

To test the difference in mean scores of post-tests among all 3 colleges, One-way ANOVA was run. The p-value for the Levene's test for equality of variance is 0.009 which is less than 0.05. Thus, equality of variance assumption is not met and accordingly non-parametric Kruskal-Wallis test was performed with a p-value of 0.000 which is less than 0.05 (Table 1.2). It statistically confirms that there is a difference in scores between the students of three colleges.

Table 1.2

Kruskal-Wallis Test

Ranks			
	College	N	Mean Rank
Post_test	College 1	80	97.18
	College 2	80	154.67
	College 3	80	109.66
	Total	240	

Test Statistics[a,b]	
	Post_test
Chi-Square	30.644
df	2
Asymp. Sig.	.000
a. Kruskal Wallis Test	
b. Grouping Variable: College	

Post hoc test Dunnett's T3 was conducted to identify the pair that differs significantly under the condition of equality of variances not assumed (see Table 1.3)

It shows a significant difference of post hoc scores between college 2 & college 1 and College 2 & college 3 as the p-values are less than 0.001. While the p-value for mean scores between college 3 & college 1 is not significant.

The mean post-test score for female students is 10.21 as compared to 8.52 for males. Since p- value of Levene's test for independent sample T test is 0.002, which is less than 0.05, the assumption for it is not met hence non-parametric tests were conducted to know the difference of mean post-test scores between genders. P-value of Mann-Whitney test is less than 0.001 so the difference in post-test mean score is significant for genders. (See fig: 1.2)

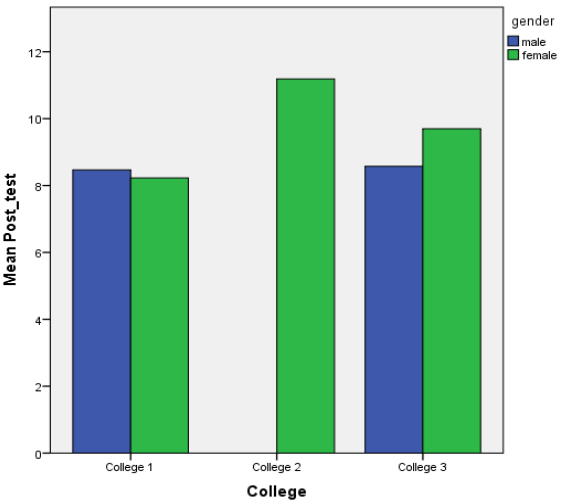


Figure 1.2

Another comparison of the post test scores were done with the score of first professional exam scores. (see Tab 1.4) The 'r' value for Bivariate correlation is 0.042 which is less than 0.3, hence there is no statistical correlation between the two variables.

Table 1.4

Correlations			
		Post-test	Marks of 1st prof Exam
Post-test	Pearson Correlation	1	`.042
	Sig. (2-tailed)		.517
	N	240	240
Marks of 1st prof Exam	Pearson Correlation	.042	1
	Sig. (2-tailed)	.517	
	N	240	240

Table 1.3

POST HOC Test for Multiple Comparisons						
Dependent Variable: Post_test						
Dunnett T3						
(I) College	(J) College	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
College 1	College 2	-2.813*	.513	**0.000**	-4.05	-1.57
	College 3	-.662	.426	.322	-1.69	.37
College 2	College 1	2.813*	.513	**0.000**	1.57	4.05
	College 3	2.150*	.520	**0.000**	.89	3.41
College 3	College 1	.662	.426	.322	-.37	1.69
	College 2	-2.150*	.520	**0.000**	-3.41	-.89
*. The mean difference is significant at the 0.05 level.						

DISCUSSION

This is the first study conducted in Peshawar which compared the conventional, hybrid and 3D teaching anatomy in three different medical colleges. During our research homogeneity between groups could not be assured due to certain factors like academic caliber of the students and their learning styles. Results may have been varied drastically by the motivation and dedication of the students as well as faculty. Moreover, expertise of faculty in three different medical colleges is also different which can affect the efficient delivery of the teaching content.

The pretest conducted in the beginning showed that there was no significant difference in academic scores of all three medical colleges which was in concert with findings of the study conducted by Slater et al.[19] There is statistically significant difference in pre and posttest which showed that all teaching methods in their respective colleges are affective which is consistent with the study of Young et al who also explained that students exposed to either of two teaching methods can show better academic performance provided teaching methods are efficiently delivered.[20]

Our results also demonstrated that posttest mean score is highest in college 2 (Hybrid model) although there was no difference in academic scores of colleges using conventional and 3D Cyber anatomy teaching which is contrary to the results of Haque et al who emphasized that students in their setup showed better learning outcomes through 3D Cyber anatomy teaching.[1]

Post test score was also significant between genders showing female predominance which is consistent with findings of Atlasi et al who showed a strong positive attitude of female students towards anatomy learning.[5] These findings were also consistent with the findings of Nuzhat et al.[21] Based on our findings, in future further studies can be conducted to compare the learning capabilities of students based on gender and possible factors that are influencing these results.

CONCLUSION

There is no difference in academic performance between the students taught either by conventional method or 3D cyber anatomy. The results also showed a significantly better academic performance of female students as compared to males.

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CONFLICT OF INTEREST
Authors declare no conflict of interest.
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AUTHORS' CONTRIBUTION

The following authors have made substantial contributions to the manuscript as under:

Conception or Design:	MJ, NR
Acquisition, Analysis or Interpretation of Data:	MJ, NR, AK, MI, FH, SJ
Manuscript Writing & Approval:	MJ, NR, AK, MI, FH, SJ

All the authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.