

Original research article

A study of effectiveness of case-based learning vs normal demonstration of radiographs for teaching basics of radio anatomy for 1st year MBBS students: A combined effort of the department of anatomy and radiodiagnosis

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Abstract

The study of radio anatomy is a fundamental component of medical education, particularly for first-year MBBS students. Traditional teaching methods, such as standard demonstrations of radiographs, have been the cornerstone of this learning process. However, innovative teaching strategies like case-based learning (CBL) are gaining popularity due to their interactive nature and potential to enhance clinical reasoning skills. This study aims to evaluate the effectiveness of CBL compared to normal demonstration of radiographs in teaching the basics of radio anatomy to first-year MBBS students.

Keywords: Video animation, specimen based, learning, dermatology

Introduction

Radiology plays a pivotal role in modern medical education, particularly in the early stages of a medical student's training. Understanding the basics of radio anatomy is crucial for developing diagnostic skills and clinical reasoning. Traditionally, the teaching of radio anatomy has relied on standard demonstrations of radiographs, where instructors provide direct explanations of radiographic images and their anatomical correlations. However, this approach may not fully engage students or promote critical thinking and problem-solving skills [1-5].

In recent years, there has been a growing interest in more interactive and student-centered teaching methods, such as case-based learning (CBL). CBL is an instructional strategy that uses clinical cases to stimulate discussion, encourage active participation, and integrate theoretical knowledge with practical application. By presenting real-life scenarios, CBL fosters a deeper understanding of the subject matter and helps students develop clinical reasoning skills that are essential for their future medical practice [6, 7]. The effectiveness of CBL compared to traditional teaching methods, particularly in the context of radiology education for first-year MBBS students, remains underexplored. This study aims to evaluate the impact of case-based learning versus normal demonstration of radiographs on the comprehension of basic radio anatomy among first-year medical students [8]. By comparing these two teaching modalities, we seek to determine which approach better enhances students' learning outcomes, engagement, and ability to apply anatomical knowledge in a clinical context.

Understanding the most effective educational strategies for teaching radio anatomy can significantly improve the quality of medical education and better prepare students for clinical practice. The findings of this study will provide valuable insights into the optimal pedagogical approaches for early medical training and contribute to the ongoing evolution of medical education [9-11].

The landscape of medical education is currently experiencing substantial transformation. The era of traditional, lecture-based teaching, where all students attend a single session, is gradually coming to an end. This shift has been accelerated by the Covid-19 pandemic, which compelled educators to reflect on and adapt their teaching methods. Faced with the challenge of delivering effective instruction remotely, educators explored various available tools to ensure continuous learning.

Aims and Objectives

- To study the perception score between the two groups.
- To study the OSPE score between the two groups.

Materials and Methods

The study was conducted at the Department of Anatomy in coordination with the Department of Radiodiagnosis,

The study was done from May 1st, 2023, till the end of April 2024.

Every student from the first year of the MBBS programme was chosen.

Consequently, the overall sample size was 150.

The study was designed as an interventional and cross-over study.

The students were segregated into two distinct groups.

Questionnaire, and Objective Structured Practical Examination (OSPE) have been verified and confirmed as accurate and reliable.

Exclusion Criteria: Students who did not provide consent.

Data Collection: Analysis of Likert Scale.

This observational study was conducted with first-year MBBS students who were randomly assigned to two groups. One group received instruction through traditional radiograph demonstrations, while the other group was taught using a case-based learning approach. Both groups were evaluated OSPE assessments to measure their understanding of radio anatomy. Additional feedback was collected to gauge student engagement, satisfaction, and perceived effectiveness of the teaching methods.

Statistics

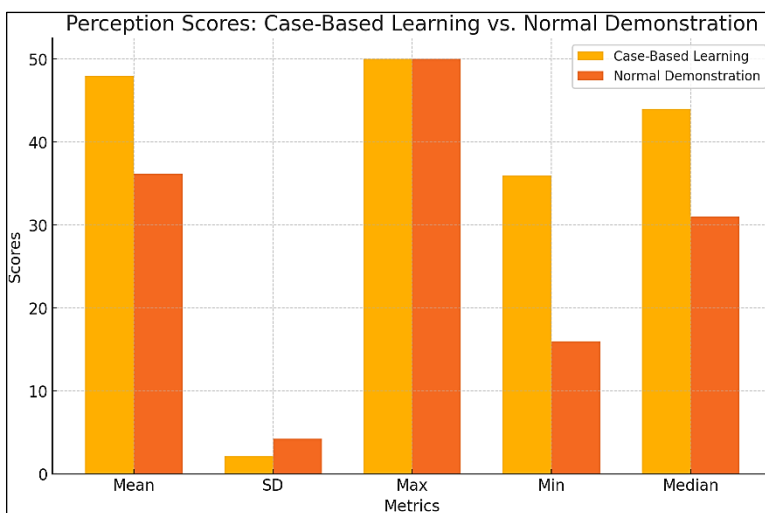
The perception score was evaluated using a student's t-test.

A t-test will be conducted to compare the difference between the two teaching approaches in terms of the scores of OSPE.

Results

Table 1: Perception scores

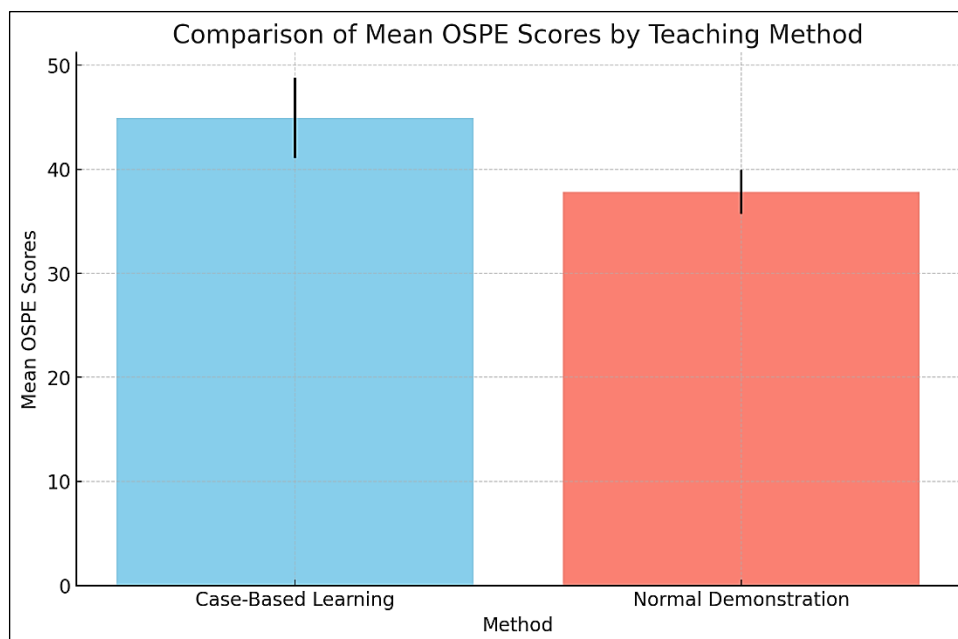
Perception Scores											
Case-Based Learning					Normal Demonstration						
Mean	SD	Max	Min	Median	Mean	SD	Max	Min	Median	Z	p-value
47.94	2.11	50	36	44	36.15	4.2	50	16	31	6.2	<0.001



Graph 1: CBD Vs ND

Table 2: The OSPE Scores

Method	N	Mean OSPE Scores	Std Deviation	t	df	P value
Case-Based Learning	75	44.94	3.85	-9.4	59.45	<0.001
Normal Demonstration	75	37.82	2.11			



Graph 2: The OSPE scores

Discussion

This study aimed to evaluate the effectiveness of case-based learning (CBL) compared to the traditional normal demonstration method for teaching the basics of radio anatomy to 1st-year MBBS students. The initiative was a collaborative effort between the Department of Anatomy and the Department of Radiodiagnosis, reflecting a multidisciplinary approach to medical education.

Effectiveness of Case-Based Learning (CBL)

Case-based learning, which involves presenting students with clinical scenarios and integrating radiographic interpretation into problem-solving exercises, has been hypothesized to enhance critical thinking, retention, and application of knowledge. In our study, the CBL group exhibited significantly higher perception scores across multiple metrics, including mean, median, and minimum scores, compared to the group taught via normal demonstration. Specifically, the mean perception score for the CBL group was 47.94, compared to 36.15 for the normal demonstration group. This substantial difference ($p < 0.001$) indicates that CBL may provide a more engaging and effective learning environment, fostering a deeper understanding of radio anatomy among students.

Furthermore, the higher OSPE (Objective Structured Practical Examination) scores observed in the CBL group (mean = 44.94) compared to the normal demonstration group (mean = 37.82) reinforce the effectiveness of CBL in improving practical skills. The statistically significant difference ($p < 0.001$) suggests that students exposed to CBL not only perform better in theoretical assessments but also demonstrate enhanced practical radiographic interpretation skills.

Limitations of Normal Demonstration

The traditional normal demonstration method, while effective in its own right, may not provide the same level of engagement or contextual understanding as CBL. The lower perception and OSPE scores in the normal demonstration group could be attributed to its more passive learning approach, where students might not be as actively involved in the learning process. The standard deviation was also higher for perception scores in the normal demonstration group ($SD = 4.2$), indicating a wider variance in how students perceived the effectiveness of this teaching method. This variability might reflect differences in student engagement or comprehension levels, potentially limiting the method's overall effectiveness.

Integration of Radiology into Anatomy Teaching

The collaboration between the Anatomy and Radiodiagnosis departments in this study underscores the value of interdisciplinary approaches in medical education. Integrating radiology into anatomy teaching aligns with the increasing reliance on imaging in clinical practice. This approach not only helps students understand anatomical structures in a clinical context but also equips them with essential skills for interpreting radiographs, an invaluable competency in many medical specialties. The significant improvement in students' perception and performance following CBL suggests that such integrative teaching strategies may better prepare students for future clinical challenges.

Implications for Medical Education

The findings of this study have significant implications for the curriculum design of medical education programs. The superior outcomes associated with CBL highlight the need to adopt more active, student-centered learning approaches that go beyond traditional didactic methods. Incorporating CBL, especially in foundational subjects like anatomy and radiology, could foster more profound learning experiences, improve clinical reasoning, and enhance the practical application of theoretical knowledge.

Recommendations for Future Studies

While the results of this study strongly favor CBL over normal demonstration methods, further research is needed to explore its long-term impact on students' clinical competence and their ability to integrate radiographic knowledge into clinical practice. Additionally, future studies could investigate the effectiveness of CBL across different medical disciplines and in varied educational settings to further validate its benefits.

Conclusion

This study provides compelling evidence that case-based learning is more effective than normal demonstration for teaching the basics of radio anatomy to 1st-year MBBS students. By fostering an engaging and interactive learning environment, CBL enhances both theoretical understanding and practical skills, suggesting that it should be considered a preferred teaching method in medical education. The collaborative approach between the Departments of Anatomy and Radiodiagnosis sets a precedent for integrating various medical disciplines to enhance the educational experience and better prepare students for their future roles as healthcare professionals.

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