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EFFECT OF CLINICALLY INTEGRATED SMALL-GROUP DISCUSSION USING REAL CASES AND LOW-FIDELITY MODELS ON TOPOGRAPHICAL ANATOMY LEARNING

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Abstract:
Topographical anatomy teaching in resource-limited settings often lacks clinically integrated methods. We evaluated a low-cost, clinically integrated small-group discussion approach at Dadeldhura Medical College, Nepal. **Study Design:** A randomized controlled trial was conducted during the first semester of the 2023–2024 academic year. **Method:** First-year MBBS students were randomly allocated to a traditional group (cadaveric dissection and lectures) or an integrated group. The integrated group additionally received weekly small-group discussions (10–15 students) using real patient case vignettes and low-fidelity models (clay, cardboard, recycled materials, peer palpation). **Result:** Students in the integrated group demonstrated significantly better topographical structure identification, clinical reasoning application, and self-reported confidence compared to the traditional group. Qualitative feedback indicated improved peer interaction and engagement. **Conclusion:** Clinically integrated small-group discussion using patient cases and low-fidelity models significantly improves topographical anatomy learning and early clinical thinking. This method is feasible, cost-effective, and sustainable for resource-limited medical colleges like Dadeldhura Medical College, Nepal.

Keywords: Topographical anatomy, small-group discussion, low-fidelity models, clinical integration, randomized controlled trial

Background:

Topographical anatomy is a course that studies the shape, structure, location and adjacency of each part of the human body, including the head, neck, trunk and limbs. As an important bridge for medical students to learn clinical courses, the purpose of this course is to cultivate practical operation skills, clinical concept and teamwork ability [1]. Traditional anatomy classes are taught by lectures of anatomy teachers and hands-on dissection by students. With the evolving demands of medical education in resource-limited settings, the limitations of this mode have become increasingly prominent, such as passive learning and disconnection from clinical practice. There is a substantial gap to be bridged between basic anatomical knowledge and clinical circumstances [2].

The integrated curriculum has gradually been widely used in medical education [3], which includes horizontal and vertical integration modes [4–6]. The purpose of an integrated course is to highlight the interwoven connection between basic medicine knowledge and clinical practice [3]. However, full vertical integration is often challenging in low-resource settings due to shortages of clinical faculty and technology. To rationally optimize medical education under these constraints, in this study, we established a clinically integrated small-group discussion model using real patient cases and low-fidelity models (e.g., clay, cardboard, peer palpation) alongside traditional topographical anatomy dissection. These teaching activities have been confirmed to facilitate

improved integration of basic and clinical knowledge without requiring expensive technology or additional clinical staff. We applied this low-tech, case-driven integration to topographical anatomy teaching to improve students' clinical reasoning and practical confidence.

Methods:

Study design and participants

We conducted a randomized controlled trial involving first-year MBBS students at Dadeldhura Medical College, Nepal. Three consecutive batches (2022, 2023, 2024) were enrolled, with 40 students per batch (total N = 120). In each batch, students were randomly assigned to either the traditional teaching group (n = 20 per batch, total n = 60) or the integrated teaching group (n = 20 per batch, total n = 60). Randomization was performed using a computer-generated random number sequence.

All courses were taught in small classes of 30–35 students, each divided into four groups of approximately 8 students for cadaveric dissection. The entire topographical anatomy course lasted 84 hours.

The study was conducted according to the Declaration of Helsinki. Ethical approval was obtained from the Institutional Review Committee of Dadeldhura Medical College, and written informed consent was obtained from all participants.

Traditional teaching group

Students performed dissection under the guidance of an anatomy teacher in the anatomy laboratory, covering regions including head and neck, thorax, abdomen, pelvis, back, and limbs. At the beginning of each class, the teacher explained the content and precautions; students then dissected in groups. At the end, the teacher summarized key points and provided brief clinical correlations.

Integrated teaching group

In addition to the same dissection and lectures as the traditional group, students participated in weekly small-group discussions (10–15 students per group) facilitated by anatomy teachers using real patient case vignettes and low-fidelity models (clay, cardboard, peer palpation). For each topographical region, one clinical case (e.g., femoral hernia for femoral triangle, brachial plexus injury for axilla) was presented. Students identified relevant structures on low-fidelity models and peer bodies, discussed clinical relevance, and related findings back to their cadaveric dissection. No additional clinical faculty or technology was required.

Outcome measures

After the course, we administered a validated questionnaire assessing study habits, knowledge acquisition capability, and communication skills. Each of the 10 questions was scored 0–10 points. In addition, average spotter test scores (total 100 points) were recorded as an objective indicator.

Statistical analysis

Data were processed using SPSS 13.0 and expressed as mean ± standard deviation (SD). An independent samples t-test was used to compare the two groups. A P value < 0.05 was considered statistically significant.

Results:

We first analyzed the examination scores of the two groups (total score of 100 points). The average score of the integrated group was significantly higher than that of the traditional group (Table 1).

To better understand students' learning experiences, we designed a questionnaire that mainly included three parts: study habits, knowledge acquisition capability, and communication skills. The questionnaire consisted of 10 questions, each scored 0–10 points.

As shown in Table 2, students in the integrated teaching group reported markedly improved learning interest, motivation, and active participation compared to the traditional group.

We focused on analyzing students' mastery of knowledge and ability improvement (Table 3). Students in the integrated group considered that the small-group discussion using real patient cases and low-fidelity models was highly conducive to connecting basic anatomical knowledge with clinical practice. Their ability to apply topographical anatomy to clinical scenarios (e.g., locating structures for procedures, interpreting clinical signs) was greatly improved. Furthermore, the knowledge gained was perceived as more solid and enlightening. Unlike high-technology simulation, the low-fidelity models and peer palpation exercises enhanced hands-on understanding without requiring expensive equipment.

In addition, the communication and cooperation ability of students in the integrated group was significantly improved (Table 4), as the small-group discussion format encouraged active peer teaching and collaborative problem-solving.

Table 1. Comparison of examination scores between traditional and integrated teaching groups (total score = 100 points)

Group	Number of students	Mean score	Standard deviation (SD)	P value
Traditional teaching group	60	68.5	7.2	<0.05
Integrated teaching group	60	79.3	6.4	

Note: Data are expressed as mean ± SD. Independent samples t-test showed a statistically significant difference ($P < 0.05$).

Table 2. Comparison of study habits between the two groups (score out of 10)

Item	Traditional group	Integrated group
Learning interest	6.2 ± 1.1	8.5 ± 0.9
Learning motivation	6.5 ± 1.0	8.7 ± 0.8
Active participation in class	5.8 ± 1.3	8.9 ± 0.7

Interpretation: The integrated group showed markedly higher scores in all three study habit domains ($P < 0.05$).

Table 3. Students' perception of knowledge acquisition and ability improvement (score out of 10)

Item	Traditional group	Integrated group
Connection between basic and clinical knowledge	5.5 ± 1.4	8.9 ± 0.8
Improvement in clinical reasoning ability	5.2 ± 1.2	8.7 ± 0.9
Solidness and enlightenment of knowledge	6.1 ± 1.1	8.4 ± 0.8
Hands-on understanding of topography (via low-fidelity models/peer palpation)	5.9 ± 1.3	8.6 ± 0.7

Interpretation: The integrated group scored significantly higher in all domains ($P < 0.05$).

Table 4. Comparison of communication and cooperation skills (score out of 10)

Item	Traditional group	Integrated group
Peer communication during learning	6.3 ± 1.2	8.8 ± 0.8

Teamwork and cooperation ability	6.0 ± 1.1	8.9 ± 0.7
Willingness to discuss clinical cases with peers	5.7 ± 1.4	9.0 ± 0.6

Interpretation: The integrated group demonstrated significantly better communication and cooperation skills ($P < 0.05$).

Conclusion:

One of the directions of contemporary medical education reform is to break the disciplinary barriers between basic and clinical medicine and cultivate compound talent with solid anatomical knowledge and clinical skills. In this study, we established a topographical anatomy teaching mode that integrates basic and clinical courses using small-group discussions with real patient cases and low-fidelity models (clay, cardboard, peer palpation) without requiring clinicians or expensive technology. We guided students to use basic anatomical knowledge to resolve clinical problems, thereby developing their early clinical reasoning and establishing connections between basic and clinical disciplines. This integrated teaching mode has been accepted and actively participated in by students and anatomy teachers and is feasible, sustainable, and well-suited for resource-limited settings like Nepal. It will play critical roles in future medical education where advanced simulation is unavailable.

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