

Case Based learning in Neuroanatomy in Small Groups for First MBBS Students

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Abstract

Background: Competency Based Medical Education (CBME) requires that we shift from didactic lectures to small group teaching method and provide early clinical exposure to students to make them more competent and skilled Indian Medical Graduates. Case Based Learning (CBL) is an interactive, student-centered and instructor-led learning method that promotes learning for competence and provides opportunities for integrated teaching.

Aims and Objectives:

1. To introduce CBL as a Teaching-Learning Method for teaching Neuroanatomy.
2. To obtain feedback from students and faculty about their perception and experience of CBL as a teaching learning method.

Methodology:

1. Hundred (100) students were given five CBL sessions on neuroanatomy (ascending and descending tracts) by dividing them into five groups comprising of 20 students each.
2. Prior to CBL sessions the students were taught ascending and descending tracts in the same small groups in rotation by 5 faculty members.
3. After the CBL sessions in small groups the students were assessed on the basis of an MCQ test on their knowledge of ascending and descending tracts.
4. Post sessions anonymous Google Based Questionnaire was given to students and faculty to assess their perceptions of this teaching learning method.

Findings: Seventy-eight (78) students responded to the feedback questionnaires out of which 95% students agreed that CBL in small groups was an effective learning tool and 95% felt that clinical case scenarios helped in meaningful progression of learning.

Conclusions: CBL was perceived as an effective teaching and learning method. It was practically relevant and added the clinical aspect to the theoretical concepts. It induced the students to think and apply their knowledge to solve the clinical cases scenarios given.

Active learning was achieved as students interacted in small groups as compared to didactic lectures. Small groups discussions and interaction with faculty led to better understanding of the concepts.

Keywords: Small group teaching method; Case based learning; Neuroanatomy; Interactive teaching method; CBME.

Introduction

Competency Based Medical Education (CBME) requires that we shift from didactic lectures to small group teaching method and give early clinical exposure to students to make them more competent and skilled Indian Medical Graduates. Further, the new CBME emphasizes on a student - centered active approach to learning where the learners become responsible for their learning.

The ascending and descending tracts in neuroanatomy are a must know area for

undergraduate students. The anatomy, course, functions and applied anatomy of these tracts been classically taught as didactic lectures to first year MBBS students. They do not comprehend the clinical relevance of the tracts and levels of lesions when actual clinical cases are given.

CBL is an interactive, student-centred and instructor-led learning method. Clinical case scenarios are written as problems that provide the students with the history, relevant symptoms and signs and diagnostic investigations of a patient. By discussing a clinical case related to the topic taught, students evaluated their own understanding of the concept using a high order of cognition. This process encourages active learning and produces a more productive outcome.¹

This type of learning has been shown to enhance clinical knowledge, improve teamwork, improve clinical skills, improve practical behavior, and improve patient outcomes. CBL advantages include providing relevance to the adult learner, allowing the teacher more input into the direction of learning, and inducing learning on a deeper level. CBL imparts relevance to medical and related curricula, is shown to tie theory to practice, and induce deeper learning. CBL is practical and efficient as a mode of teaching for adult learners.²

CBL is found to increase interactive learning for the student.³ Integrated and case-based teaching was found to be useful in imparting knowledge and better retention of the gained knowledge was inferred statistically.⁴ CBL (guided enquiry) was preferred over PBL by both students and faculty as a Teaching Learning Method.⁵

We conducted this educational project to introduce CBL as a teaching-Learning method for teaching neuroanatomy in small groups and to obtain feedback from students and faculty regarding their perception and experience CBL as a teaching learning method.

Materials and Methods

Our study was a cross-sectional observational study conducted on 100 students of First MBBS (2018–2019 batch) at Army College of Medical Sciences, Delhi. The duration of study was 5 months and for which permission was obtained from the Institutional Ethics committee.

The faculty and students were introduced and sensitized to the introduction of CBL in small groups as a teaching-learning tool. Google forms/ Questionnaire for faculty and students were

prepared and validated with the help of faculty of Department of Anatomy and MEU of ACMS. After the sensitization of students, their email id and phone numbers were collected for posting of feedback forms.

Five important tracts of neuroanatomy (4 ascending and 1 descending) were selected and 5 clinical case scenarios based on their applied anatomy were drafted.

Hundred students of first MBBS were divided into 5 groups comprising of 20 students each. Five faculty members were assigned to teach one tract each.

Step I

- (a) Each teacher taught 04 ascending + 01 descending tract in rotation to all 5 Groups. For e.g., spinothalamic tract was taught by one teacher to all 5 Groups in rotation (½ an hrs per group).
- (b) After this a draw of lots was done of 5 cases (one per tract) and Each Group got a clinical case based on a tract.

Step II

All 5 Groups of 20 students were given relevant teaching/learning material of their clinical case and tract to read and discuss for next 48 hours.

Step III

- (a) All students gathered in groups and discussed clinical cases with the respective anatomy faculty.
- (b) Each Group presented their topic (by Group Leader) for 15 minutes each followed by 5 minutes of summarization by the faculty.
- (c) All teams heard the cases of all groups and summarizations.
- (d) A post session-Google Questionnaire for faculty and students on Effectiveness of CBL.
- (e) MCQ Test on Tracts in Neuroanatomy.

The *Google Questionnaire on Students perception of CBL* had 4 sections:

- a. *Section I* had eight close ended questions with 5 point Likert Scale response.
Strongly disagree = 1, Disagree = 2, Neutral = 3, Agree = 4, Strongly Agree = 5.
- b. *Section II* dealt with close ended questions on role of facilitator.

- c. Section III was on effectiveness of orientation session.
- d. Section IV dealt with suggestions to make CBL in small groups a more effective method.

The Faculty feedback was taken after the CBL sessions. The Google Questionnaire for faculty perception of CBL had ten closed-ended questions with 5-point Likert scale response.

Statistical analysis

The google forms inbuilt statistical analysis was used to analyze the responses. The response to close ended questions was expressed as percentage.

Open ended questions were analyzed by thematic grouping of qualitative responses.

Results

Section I

Of the hundred students included in the study 78% participated in the analysis. 95% students agreed that CBL in small groups was an effective learning tool (Table 1). 92% students preferred this method to the traditional method of learning. 87.2% students thought that CBL in small groups helped in improving communication skills (Table 1). 95%

Table 1: Student Google Questionnaire responses of section I (n = 78)

S No	Question	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1.	Case Based Learning (CBL) in small groups was an effective learning tool for me	0	4 (5.1%)	0	22 (28.2%)	52 (66.7%)
2.	CBL in small groups was better than traditional method of learning	0	2 (2.6%)	4 (5.1%)	34 (43.6%)	38 (48.7%)
3.	CBL in small groups helped me in better understanding of anatomy of tracts	0	0	8 (10.2%)	23 (29.5%)	47 (60.2%)
4.	CBL sensitized me towards clinical case solving in neuroanatomy	0	0	2 (2.6%)	26 (33.3%)	50(64.1%)
5.	Clinical case scenarios helped in meaningful progression of learning	0	2 (2.6%)	2 (2.6%)	28 (35.9%)	46 (58.9%)
6.	CBL in small groups promotes peer discussions and peer communication	0	2 (2.6%)	7 (8.9%)	10 (12.8%)	59 (75.6%)
7.	CBL helps in improving communication skills	0	2 (2.6%)	8 (10.2%)	18 (23%)	50 (64.1%)

Table 2: Thematic Aggregation of Qualitative responses by students about CBL

Appreciation	No and presentation of cases	Time	Other advantages
It should be held at regular intervals	Adding more questions per case that everyone gets to present the answer.	Longer time required	Overall
Should be done on regular basis	Presentation of cases can be little different	Timing and coordination should be better	Apart from improving communication skills and increasing interest in clinical application, it will also be helpful in academic performance
Everything was perfect according to me	More clinical cases should be discussed	Audio video aids could be effective to better understand the topic	
More topics included under this method. Helps in practical application	More no of cases should be provided	There should be different difficulty level of cases so that we could compare how the disease progresses	Overall the CBL method of teaching is an excellent idea as it involves more from the student side and I think it improves our thinking ability about clinics
More equally important topics like abdomen and pelvis along with their clinical based questions should also be taught using this method	The number of cases should be more so, as the students think in more than a single direction for cases in order to understand the topic better	Although it was very effective and innovative but it was very time consuming too. (May be because it was held in 1 st term) Its efficiency could have been increased by managing the time being taken by each group to solve a particular case. So, that student's solve it more seriously and quickly which will enhance their clinical outlook and ability to reach any clinical conclusion more quickly with preciseness. Otherwise we liked it	
	A Mike should be provided to the students so that, we can hear them clearly and this thing can be done in other subjects too		I found CBL is best for understanding neuroanatomy

Table 3: Faculty Google Questionnaire about perceptions of CBL ($n = 5$)

S No	Questions	Strongly disagree	Disagre	Neutral	Agree	Strongl Agree
1	CBL stimulates students' desire to learn	0	0	0	1	4
2	Students felt confident to apply theoretical knowledge of tracts to solve clinical cases	0	0		3	2
3	CBL is a good method to practice integration of knowledge and skills	0	0	0	1	4
4	CBL preparation requires a lot of effort	0	0	0	3	2
5	CBL is time consuming and hinders the normal speed of the class	0	0	1	3	1
6	It is feasible to conduct CBL sessions	0	0	0	2	3
7	CBL helps towards SDL (Self-directed learning) in students	0	0	0	1	4
8	I am satisfied with the CBL approach to teaching	0	0	0	2	3
9	Other topics in Anatomy should also be taught by CBL	0	0	0	1	4
10	CBL be used as a TLM for future batches	0	0	0	3	2

students were of the opinion that clinical case scenarios helped in meaningful progression of learning (Table 1). 90% students agreed that this method helped them in better understanding of anatomy of tracts (Table 1). 100% students felt that group discussion was useful in clinical case solving.

Section II and III

Ninety-seven percent students felt that the role of facilitator/faculty was important. 100% students felt that the faculty understood their queries and answered them effectively. 74% students found the orientation/sensitization before the CBL session effective. 95% liked the method so much that they wanted to be taught other topics in Anatomy by CBL method.

Section IV

Suggestions by students to make CBL in small groups a more effective method are given in (Table 2).

In the multiple choice based questionnaire, which followed the CBL session, the students showed satisfactory response. 76% of the students could answer all the questions correctly.

Data from faculty feedback questionnaires also favored CBL as a teaching method. Five faculty members participated in the CBL sessions and all agreed that CBL is a good method to practice integration of knowledge and skills and promoted self-directed learning (Table 3). Four faculty members found it to be time consuming and hindered the normal speed of the class (Table 3). All faculty found

this as a feasible TLM and wanted to teach other topics in anatomy by same method (Table 3).

Discussion

The new curriculum based on CBME requires that interactive methods of teaching should be employed to make it student centric and promote self-directed learning. CBL is a form of learning which imparts practical relevance to theoretical concepts and develops a deep level of understanding of the subject and promotes analytical thinking.

Kassebaum⁶, Singhal⁷, Tayem Yi⁸ and Joshi⁹ have found CBL an interesting and useful learning method for teaching undergraduates in Dentistry, Microbiology and Pharmacology & Biochemistry respectively. Their findings remonstrate that CBL was embraced by majority of students. The students' clinical reasoning and logical thinking were improved. Our study also, demonstrates that 95% students found that clinical case scenarios helped in meaningful progression of learning and 90% students agreed that this method helped them in better understanding of anatomy of tracts.

Tayem Yi found that 82% found CBL an effective tool in teaching pharmacology and 80% students felt that CBL improved their collaborative skills and ability to work within a team (79%). Our results are in concordance with 95% students agreeing that CBL in small groups was an effective learning tool and 87.2% students thought that CBL in small groups helped in improving communication skills.

On the contrary, Nordquist et al.¹⁰ observed

that implementation of CBL was not satisfactory due to inadequate implementation process and devised a checklist for its implementation in a surgical curriculum.

Singhal divided his class of 100 students into two groups and compared between didactic lectures and CBL sessions as methods of teaching and then did a crossover. A post-test MCQ questions was conducted immediately and after 6 weeks to see effectiveness of CBL and the post 6 week test favored CBL. We did not do a crossover and all 100 students were offered the CBL module.

Massonetto et al.¹¹ also introduced small group discussion of cases in an Obstetrics and Gyne teaching programme of 4th year undergraduates and the group taught by the new method gave higher rating of clarity of concepts. In our study group also, 90% students agreed that this method helped them in better understanding of anatomy of tracts.

Ghosh S¹² have tried a combined approach of teaching physiology by adding CBL tutorials to didactic lectures and found that 84% students preferred this combined approach.

Hasamnis et al.¹³ used CBL sessions for clinical pharmacology to enhance learning and used the DREEM (Dundee Ready Education Environment Measure). Questionnaire of 50 items to assess case based learning on clinical pharmacology. However, we used pre-validated Google Questionnaires for analyzing our study.

Dubey et al.¹⁴ observed that of the Eighty-one students who participated in CBL sessions in pathology 95.06% expressed a desire for more such sessions in all topics of pathology. These results were similar to ours where 95% students liked the method so much that they wanted to be taught other topics in Anatomy by CBL method.

It is evident from students' and teachers' questionnaires that CBL helps in internalization of concepts and stimulates the desire to learn. The students feel confident to apply the theoretical knowledge of anatomy imparted to solve clinical cases. Thus, CBL imparts practical relevance to theoretical knowledge.

Our faculty admitted that the whole experience was quite interesting. The faculty received this method with enthusiasm and gave constructive suggestions for drafting case scenarios, validation of google questionnaires and conduct of sessions.

Students found the methods a welcome change from the mundane lectures and felt it should have been initiated earlier in the academic year to enhance their interest in the subject.

Conclusion

CBL was perceived as an effective method of teaching and learning which was practically relevant and added the clinical aspect to the theoretical basis. It induced the students to think and apply their knowledge to solve the clinical cases scenarios given.

Active learning was achieved as students interacted in small groups as compared to didactic lectures. Small group discussions and interaction with faculty led to better understanding of the concepts. CBL though requires more efforts both from faculty and students but the concept and application were found to be feasible and relevant to the new curriculum.

Limitations

The students were busy in preparations for their prelims exams and so 22% did not participate in the study. Paper case scenarios were given. These could have been designed more elaborately with audio and visual aids.

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Conflict of Interest: None

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