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## Case –Based Teaching of Neuro-Physiology for Preclinical Student

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### Abstract

Medical schools have realized the importance of including clinical work early and have termed the mixing of basic and clinical sciences as vertical integration. Early clinical exposure is being done for teaching basic sciences and applied aspects medical students. As part of above mentioned programme we make an attempt to teach neurophysiology by case-based approach. Pre-clinical medical students were chosen for our study. We chose pyramidal tract study-both normal physiology and applied aspects to teach students by conventional didactic method and case based study. Students showed better performance in learning the applied aspects of neurophysiology after the case-based study method. The initiative not only integrated physiology with related basic sciences and clinical medicine but importantly linked students' developing knowledge of theory to practice.

### Article Info

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### Keywords

Medical schools,  
Teaching of Neuro-Physiology,  
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### Introduction

Medical and health care-related education is currently changing. Medical schools have realized the importance of including clinical work early and have termed the mixing of basic and clinical sciences as *vertical integration* (1). Case-based learning is a relatively new method of teaching basic sciences in medical colleges. In India this method is yet to become routine in undergraduate teaching. Still majority of medical colleges follow the routine didactic lectures.

The aim of our study is to compare the effectiveness of conventional didactic lecture (CM) and case-based teaching method (CBL) for teaching neuro-physiology for preclinical medical students in our medical college. The basic science knowledge learned in the context of a clinical case is actually better comprehended and more easily applied by medical students than basic science knowledge learned in isolation (2).

### The neurophysiology topic

The major motor system in the brain that controls movement of all four limbs in the human beings is the cortico-spinal tract, commonly called as pyramidal tract. Hemiplegia is the most common neurological disease that affects elderly. Hemiplegia is mostly due to ischemia involving the pyramidal tract. The pyramidal tract, after its origin from the Betz cells in the cerebral cortex, course through various areas in the brain like-corona radiata, internal capsule, midbrain, pons and medulla oblongata. The lesion in each of this areas produces different types of hemiplegia and different clinical presentation. For eg. lesion in the internal capsule produces what is called as classical capsular hemiplegia and lesion in midbrain produces crossed hemiplegia in which there is hemiplegia in one side and cranial nerve paralysis on the other side. Thus by carefully studying these cases in clinical practice, we can identify the site of lesion and the level of pyramidal tract involvement. Thus

there is a significant clinico-physiological correlation. This may help student in learning the applied aspect of the lesions in pyramidal tract. Such case –based learning at the early stage in the medical college, makes the student become better clinicians.

**Basic physiology of pyramidal tract**

A programme of movement formulated by the premotor cortex is converted into a series of signals in the motor cortex that are transmitted to the spinal cord in the pyramidal tract. This passes through the internal capsule and the ventral brainstem before decussating in the medulla to enter the lateral columns of the spinal cord. The pyramidal tract ‘upper motor neurons’ synapse with the anterior horn cells of the spinal cord grey matter, which form the lower motor neurons. These upper motor neurone in the pyramidal tract controls the opposite of the body, especially posture, muscle power, tone, contraction, co-ordination etc .Lesions affexting the upper motor neurone result in increased muscle tone, exaggerated reflexes, etc.-resulting the classical hemiplegia (paralysis of one half of the body) in the opposite side of the body. Hemiplegia in common parlance is known as stroke. It is an medical emergency condition.

**Materials and Methods**

A descriptive cross-over study was conducted, in which the students after learning the pyramidal tract

neurophysiology by conventional method and applied aspect of the lesions of the pyramidal tract by case-based learning method were examined after each of two sessions. Simple true or false type questions were used to assess each student's comprehension after each session and compared.

Sixty preclinical medical students, first year MBBS students, were chosen for this study. An important topic in neurophysiology –cortico-spinal tract Course physiology –was taught to all students by conventional didactic lecture. A pre-test questionnaire was given to all the students. They were divided into two groups-, Group A & Group B, each with 30 students. (table-1) .Group A students were then given the applied aspect of the chosen topic by conventional teaching method (CM) and then they were assessed by a post-test questionnaire. Group B students were shown images of real clinical neuro- case as part of case-based study (CBL) and then they were assessed by the same post-test questionnaire

**Results and Discussions**

Students showed better performance, in learning applied neurophysiology after the case-based study method. There was 40 % improvement by conventional teaching method, while there was 50 % improvement by case-based learning method. The students feedback indicated that case-based teaching could be used as an alternative to conventional lectures and may facilitate skills acquisition, (3)

**Table.1** Participants number

Type of questionnaire	GROUP-A (n=30)	GROUP-B (n=30)
Pre-test questionnaire in CM	10 questions	10 questions
Post-test questionnaire in CM	10 questions	-
Post-questionnaire in CBL	-	10 questions
Feed-back Questionnaire on CBL	-	10 questions

**Table.2** Pre-test questionnaire (n=60) results

Number of correct answers	Group A	Group B	Total
< 5	28	26	54
6-7	2	4	6
8-10	-	-	-

**Table.3** Post-test questionnaire for group A students (n=30) who had “CM” of learning

Number of correct answers	Group A
< 5	18
6-7	9
8-10	3

**Table.4** Post—test questionnaire for group B students (n=30) who had “CBL” of learning

Number of correct answers	Group B
< 5	15
6-7	13
8-10	2

**Table.5** Comparison of both methods of learning

Number of correct answers	Group A	Group B
< 5	18	15
6-7	9	13
8-10	3	2

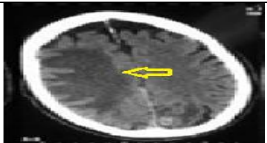
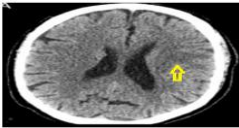
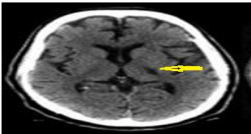
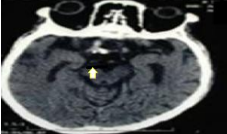
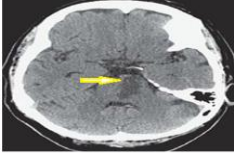
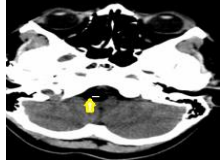
**Table.6** Post-test feed-back survey for CBL method

comments	Strongly disagree	Disagree	Agree	Strongly agree
1.CBL is a better method of learning than the conventional one.	-	-	28	2
2. The learning format using case-based study helped one learn the content in a more comprehensive way	-	-	20	10
3.It promotes better understanding of neurophysiology and its applied aspect.	-	-	26	4
4.It helps in better retention of knowledge.	-	-	25	5
5.It helps in improving students skills to make him a better future physicians.	-	-	30	-
6.I would like such CBL approaches to other parts of neurophysiology.	-	-	24	6

**Table.7** Brain scan reports showing cortico spinal tract lesions at various levels

Patient number	Clinical presentation	Brain lesion pyramidal tract level
Case 1	left side hemiplegia	Right motor cortex
Case 2	right side hemiplegia	Left corona radiata
Case 3	right side hemiplegia	Left internal capsule- posterior limb
Case 4	Left side hemiplegia and Right cranial nerve palsy.	brain stem -midbrain level- right side.
Case 5	Right side hemiplegia and Left cranial nerve palsy	brain stem –pons level- left side
Case 6	left hemiplegia and Sympathetic ganglia involvement	brain stem –medulla oblongata level- right side.

(Note- A brain lesion on one side, produces paralysis in opposite side half of body)

CT SCAN BRAIN section level .	Actual Brain CT scan images	Level of lesion in the pyramidal tract
Cerebral cortex		Right cerebral motor cortex-yellow arrow. Patient had left side cortical hemiplegia
Corona radiata		Left corona radiata-yellow arrow Patient had right side hemiplegia
Internal capsule		Left side internal capsule-posterior limb- yellow arrow Patient had right side classical hemiplegia
Brain stem Mid-brain		Right cerebral peduncle-yellow arrow Patient had crossed hemiplegia Hemiplegia + III cranial n.palsy
Brain stem pons		Left side pontine lesion -- yellow arrow Patient had crossed hemiplegia Hemiplegia + VII cranial n.palsy
Brain stem medulla oblongata		Right side medullary lesion- yellow arrow Patient had hemiplegia + Horner's syndrome

Conventionally, teaching of undergraduate medical students is done with the help of didactic lectures, practicals, a tutorial, and clinics, which are mostly used as passive teaching and learning methods; however, they lack in the development of problem-solving or reasoning skills of the students. The results our study indicate that

the knowledge of students is significantly improved by this new teaching method (CBL) (3. The Students' satisfaction and examination performance were better in this study. The students enjoyed case-based teaching and considered that their clinical reasoning, diagnostic interpretation and ability to think logically were

improved. The results of our study show that most undergraduate students preferred such interactive case-based discussions to traditional lectures in learning physiology. The initiative not only integrated physiology with related basic sciences and clinical medicine but importantly linked students' developing knowledge of theory to practice. (4). Although traditional lectures convey factual information well, they are not well suited to higher levels of learning, such as critical thinking, analysis and problem-solving, which must be learnt by doing. The individual teacher's qualities play a crucial role in the learning experience.

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