



Original Research Article

Integration of Problem Based Learning with Conventional Teaching for Understanding Anatomy among First Year Medical Students

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ABSTRACT

The objective of learning anatomy is its application in patient care and it may be prudent to consider that problem based learning early in medical curriculum. Time tested learning anatomy by dissecting cadaver and small group discussions apart from regular class room lectures cannot be disgraced. This study was done to evaluate the effectiveness of integrated the problem based learning approach with conventional teaching for first year medical students. This study also emphasises the objective evaluation method of assessing the learning process in small groups. Twelve problem based learning sessions were conducted along with conventional learning process involving class room lectures, small group discussions and cadaver dissection in groups of twenty five students. Groups were rotated after each test so that each group gets differential training process for three times. Learning process was assessed objectively through multiple choice and assertion – reasoning type questions. Results showed that students' performance after learning process involving integrated problem based learning with conventional learning methods was superior to other methods.

Key words: problem based learning; dissection; small group discussion; anatomy teaching

INTRODUCTION

Learning anatomy through dissection has history of many centuries. Recently it is perceived by many that such gross (topographic) dissection based study of human anatomy has exaggerated importance in initial part of medical curricula. For a student having a minimal insight into the body functions and structures, learning human anatomy upfront may be difficult.

The objective of teaching, curriculum and assessment is to encourage learning of clinically meaningful anatomy. When the main objective of learning anatomy is its application in patient care, it may be wise to consider that problem based learning will be more beneficial. Prosected cadaver specimens, life models, radiological images and telescopic views of the living body maximize learning. ^[1] The traditional

anatomy education based on topographical structural anatomy taught by didactic lectures and complete dissection of the body with personal tuition, has been replaced by a multiple range of special study modules, problem-based workshops, computers, plastic models and many other teaching tools. In some centres, dissected cadaver-based anatomy is no longer taught. Incorporation of problem based approach to learning will build strong questioning and reasoning sense in students. [2] Teaching anatomy with clinical problems will introduce the students to understand the clinical case, analyze and constructively formulate the diagnosis and management of the case.

In most of the medical colleges there is a clear distinction between preclinical and clinical years. During the preclinical course duration students are minimally exposed to clinical conditions. This compartmentalisation of medical education will ward off a medical student from the real test of perceiving, analysing a clinical case during early course. Such kind of vertical subject wise curricula has lesser chances of integrative analytical and deductive learning. To overcome this recently medical council of India in its vision 2015 gave a thoughtful insight into clinical problem based learning in the preclinical courses. [3] Adding to this innovative futuristic approach, many state universities have incorporated clinical case based evaluation in their discriminative examinations.

Active context sensitive learning has far reaching impact in application of information based factual learning in clinical practice than mere memorization. Many 'greats' in anatomy have followed and advocated problem based learning as indispensable method to introduce the medical pupil to clinical scenario. Some of the well known text books follow brief case scenario based questions at the end of each

chapter. Recent publications of Marieb [4, 5] Martini [6] and Van Wynsberghe [7] include case studies in the teaching materials. Others provide more extensive cases at the end of the major sections of the text. Learning through practice and repetition with standardized or actual patients can help students with long-term recall. Exposure to clinical scenarios may add to the deeper understanding and better memorization, greater recall. Such exposure to clinical cases will help students faced with similar clinical scenarios in the future. In making clinical anatomy teaching more relevant, clinical cases will add onto already prevalent teaching aids like radiography, surface anatomy and cadaver dissection.

This study was designed to check the relevance, credibility and reproducibility of assessments of teaching methods among small groups in first year medical students. The study also aims at standardizing an assessment methodology which objectively tests the learning process of small groups.

METHODOLOGY

The following characters are considered while selecting a case for the anatomical teaching. Selected case meets the learning objective of the anatomical parts considered. Case is informative enough to understand and deduce the relative anatomy. Case can lead to greater ramified questioning.

Study was conducted in department of Anatomy, Azeezia Institute of Medical Sciences and Research, Kollam from September 2012 to June 2013. Batch of first year students comprising of one hundred students were divided into 4 groups of twenty five each and labelled group A, B, C and D. Group A was engaged in problem based interactive learning with dissecting the part concerned as additional learning tool. Group B was engaged in problem based learning activity. Group C was

encouraged to learn the part concerned though dissection after regular theory class. Group D was made to dissect the part concerned without the theory class (Figure 1). A test was conducted to assess the learning of groups. 80% of questions were multiple choice questions. These questions will eliminate the bias and help in objective assessment. Rest 20% was assertion and reasoning type. Questions assessed the logical thinking ability of students along with didactic reasoning. Few simple memory based questions were also included in the assessment as they form the bulk of medical learning memory.

Example of problem based learning approach: Anatomy of thyroid gland.

Basis of selection – knowledge of thyroid gland anatomy is important in understanding the clinical and surgical basis of goitre.

Problem: A 16 year old female presented to the surgery OPD with swelling in the neck, which has insidious onset, slowly progressing in size. No pain reported. No sudden change in the size, no change in the

a female patient. Examination of patient was arranged with the help of department of surgery. Theory class was conducted after this. Later during dissection class, the deep structures in the anterior part of neck were demonstrated during prosection and then students were made to dissect the part on their own and appreciate the relations of thyroid gland with specific importance to its fascial coverings, relations on medial side, arterial supply and venous drainage, relationship with nerves. Ligation of vessels during thyroidectomy was demonstrated on cadaver with specific emphasis on sparing nerves which are close by.

Group B students were made to inspect the patient just as group A students. Group C students were made to dissect the anterior part of neck on their own and appreciate thyroid gland relations. Regular theory class was taken to group D students.

Questions: Multiple choice questions with single best response.

1. Thyroid gland has a) two lobes b) isthmus c) both d) none of above
2. Structures which do not move with deglutition a) thyroid gland b) parathyroid gland c) submandibular lymph nodes d) hyoid bone.
3. All are causes of midline swellings except a) goitre b) laryngeal lymph nodes c) submental lymph nodes d) jugulodigastric lymph nodes
4. Thyroid gland is named so – because – a) it's an endocrine gland b) related to 'shield' like cartilage c) it is shield like in cross section d) it shields the underlying larynx
5. Arterial supply of thyroid gland are derived from a) external carotid artery b) subclavian artery c) arch of aorta d) all of the above
6. Middle thyroid vein drains into a) internal jugular vein b) left brachiocephalic vein c) right

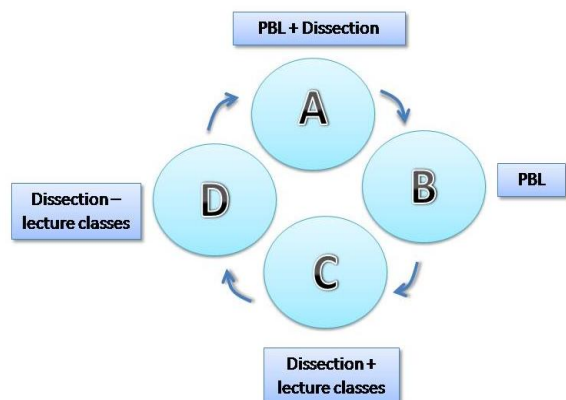


Figure 1: Schematic representation of study design.

colour of the skin over swelling. On examination, swelling was moving in vertical direction with swallowing.

Group A students were divided into two groups and were made to inspect the swelling in the anterior part of neck and to appreciate its movements with deglutition in

brachiocephalic vein d) external jugular vein.

7. Most important structure related to posterior surface of thyroid gland – a) parathyroid gland b) inferior thyroid artery c) superior thyroid artery d) thyroid cartilage.
8. True regarding superior thyroid artery – a) arches over middle cervical sympathetic ganglion. b) First branch of external carotid artery. c) Related to recurrent laryngeal nerve. d) During thyroidectomy it has to be ligated away from the thyroid gland.

Assertion and reasoning type: Mark A. Both A and R are true and R is the correct explanation of A. B. Both A and R are true but R is NOT the correct explanation of A. C. A is true but R is false. D. A is false but R is true.

1. A. Capillary network of gland is situated deep to its true capsule unlike prostrate.

R. Bleeding is minimal during thyroid surgery if the lobe is removed along with true capsule.

2. A. Levator glandulae thyroidea is fibromuscular band band.

R. It is the main reason for movement of thyroid with deglutition.

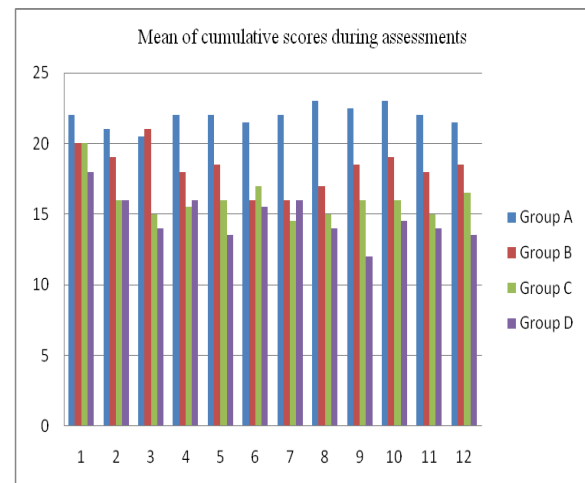
Study was conducted with twelve such problem based learning and the assessment papers were evaluated in a double blind manner to minimize the bias. The groups A, B, C and D were rotated with each new problem/case. Rotations were carried out in such a way that each student will fall into all four groups thrice during the study. Rotation was expected to minimize the students' intrinsic performance differences. Results were tabulated and statistical significance was evaluated using student 't' test. P value less than 0.05 were considered as significant. Cumulative marks master chart was prepared comprising of all

twelve assessments which is taken from individual groups.

RESULTS

Table I: Tabulation of mean of cumulative scores during assessments. *P<0.05, **P<0.001

Test No.	Group A	Group B	Group C	Group D
1	22	20	20	18
2	21	19	16	16
3	20.5	21	15	14
4	22	18	15.5	16
5	22	18.5	16	13.5
6	21.5	16	17	15.5
7	22	16	14.5	16
8	23	17	15	14
9	22.5	18.5	16	12
10	23	19	16	14.5
11	22	18	15	14
12	21.5	18.5	16.5	13.5
Mean	21.92	18.29*	16.04**	14.75**
SD	0.70	1.41	1.38	1.53



Graph I: Graph showing mean of cumulative scores of groups during all twelve assessments.

The evaluation assessment scores were tabulated, mean and standard deviation calculated. Table I shows the tabulation of mean and SD of assessment scores of all twelve tests of all groups. Mean scores of group A, B, C and D were 21.5, 18.5, 16.5 and 13.5 respectively out of 25.

The difference in mean of students assigned as group A and group B during all twelve assessments was statistically significant with p<0.05. similarly means of student performance in assigned groups A

Vs C and A Vs D differed very significantly with $p < 0.001$.

DISCUSSION

Learning human anatomy, at least for the beginner in first year medical student involves memorising rather strange names and relations of the structures. Student is expected to learn the clinical and surgical relevance of anatomy through projected material or via dissection. Introduction of clinical problems early in the curriculum, equip students with armamentarium of solutions. This will make students to get focused towards the solutions which may prove very useful when they confront with real cases in future. Introduction of clinical cases early in the course material will pay way for students to build and accumulate knowledge from different subjects and correlate better and superior horizontal integration. This study evaluates such early exposure to clinical cases in anatomy and aims at improving students learning and correlating in clinics and surgery.

In the present study students who were exposed to cases and subsequently dissected the part had superior hold on clinical knowledge in comparison to students who were exposed to cases or to students who just listened to lecture classes or done dissection alone. Present study assesses the students' ability to learn the anatomical basis of clinics and surgery. The multiple choice questions, assertion and reason type of questions in the present study tests the anatomical facts or relations of the part concerned so that students can carry the knowledge forwards.

Problem based learning in medical curricula is not new. Over 100 medical schools around the world have adopted this approach to teach medicine. Study in Harvard medical school regarding effectiveness of problem based learning in teaching anatomy concludes that dissection and regular small

group discussions backed by tutorials is essential in clearing the doubts and lacunae of problem – restricted learning. [8] Another study assessing the perception of first and second year students regarding problem based leaning in anatomy also concludes that dissection has to be integrated with clinical cases. [9] Studies also implicate that integrating computer aided technology and clinical cases along with regular dissection curricula will greatly improve the approach of students towards clinical problems. [10] Problem based learning in this interdisciplinary anatomy course allows students and faculty both horizontal and vertical integration within the curriculum. [11]

Though learning methodology of anatomy is changing, there are studies which outweigh traditional learning method over newer methods and argue time tested dissections and lecture classes have more impact and whole learning among students. [12] Such problem based learning may be stressful for the students according to some studies. [13] Such stress can be alleviated by proper selection and design of the cases covering all the learning objectives of the part concerned. We disagree with previous studies which favour conventional teaching methods for effective and efficient teaching of anatomical basis of surgery. Though not all aspects of anatomy are learnt through problem based learning and subjects like embryology, general anatomy need conventional teaching methods, clearly rest of the topics in anatomy such as regional anatomy, osteology and histology has to be integrated with problem based approach. We recommend an integrated approach comprising of conventional dissection and group discussions with problem based learning.

CONCLUSION

The present study clearly proves that integration of problem based learning into the curricula anatomy along with dissection and group discussion will have better knowledge transfer and subsequent superior clinical and surgical correlation.

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