

Improvement of Motivation and Learning Level in Neuroanatomy Among Hamadan Medical Students Using Human Brain Sections

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Background: Using new methods in teaching anatomy could have a significant impact on students' learning.

Objectives: Neuroanatomy is one of the most complicated courses in anatomy. Absence of educational assistance equipment is one of the most important problems in this field. Using human brain sections could solve some of the problems and enhance students' learning.

Materials and Methods: The brains of cadavers in dissection room of medicine faculty of Hamadan University of Medical Sciences were used in the present study. After fixation, the brains cut in three coronal, transverse and sagittal sections. Then, the sections were presented to one group of students in practical classes. Another group continued as control with routine educational method. The students filled out a questionnaire and declared their ideas about the new methods in Neuroanatomy education. Finally, two groups were compared for marks gained in the final exam.

Results: Using present method had remarkable effect on learning progress and prevention of exhaustion of students in the classroom. Moreover, it increased marvelously their ability in three-dimensional imagination in anatomy. Quantitative analysis of the final examination showed significant increase in the marks of experimental group ($P < 0.05$).

Conclusions: According to the subjective and objective results, the new method used in anatomy education had a good effect on learning of anatomy and interested students in anatomy. Besides, it decreased students' stress at exam time. It can be a complementary method for conventional methods. It is very useful for those who need retraining courses.

Keywords: Education; Brain Sections; Neuroanatomy; Students, Medical

1. Background

Undoubtedly, in the recent years, the field of medicine and knowledge of anatomy are known as a basic necessity. Recently, anatomical sciences turned from a descriptive science into practical science and have a bright and important role in all fields of medicine.

Surgical anatomy, radiological anatomy, comparative anatomy, surface anatomy, developmental anatomy and sectional anatomy are all subcategories of anatomical sciences with a great value in the clinical field.

Based on professors and students beliefs, anatomy of the human brain and nervous system is one of the most complicated subjects in anatomical sciences field. It is a very important issue for medical students to completely learn neuroanatomy before entering their clinical stages. Advanced methods such as using multimedia and educational software might resolve this educational problem (1, 2).

Studying on human brain sections in coronal, sagittal

and axial directions provides an excellent chance for better understanding, especially for neurosurgery residents, neuroradiologists, neurologists and all physicians related to medical sciences. Moreover, they can help physicians to interpret better CT and MRI cross-sectional images (3).

Complexity of neuroanatomy makes physicians disappointed and they are not interested to study it. Their basic knowledge about neuroanatomy is not enough when they enter their clinical courses. Therefore, the present study tried to provide human brain sections in three directions for medical students.

Using brain sagittal, coronal and axial sections facilitate imagination of different regions of the brains for students. Besides, they can explain better the relations between adjacent anatomical structures. For example, location of basal ganglia and thalamus in sagittal and coronal sections provides better spatial understand-

ing of anatomy for medical students and neurosurgery residents (4, 5). Close communication between basic sciences and clinical courses is one of the priorities in all medical universities (6). We are trying to encourage clinicians to spend more time in anatomy department and dissection rooms.

2. Objectives

In the present project, coronal, sagittal and axial sections of human brain were prepared and presented to medical students to evaluate a new method in neuroanatomy education. Finally, its efficiency was analyzed both in quality and quantity.

3. Materials and Methods

3.1. Preparation of Human Brain Samples

The human brain samples were dissected from the cadavers dissection room of Department of Anatomical Sciences in Hamadan University of Medical Sciences. The brains were fixed in 10% formalin. After fixation, the brains were cut in three different coronal (Figures 1 and 4), sagittal (Figures 2 and 6) and transverse (Figures 3 and 5) sections. The sections were kept in 10% formalin to avoid drying.



Figure 1. Human Brain Coronal Sections



Figure 2. Human Brain Serial Coronal Sections

3.2. Evaluation of Efficiency of the New Method in Teaching Neuroanatomy by a 5-Scale Likert Questionnaire

A 5-point Likert scale questionnaire was designed in four main topics as mentioned below:

- 1) Improvement of the level of theory and its application in clinic
- 2) The effectiveness of this method compared to other traditional methods
- 3) The efficiency of new method
- 4) Increase in motivation among students to study more

3.3. Quantitative Evaluation of Students After Using the New Method in Neuroanatomy Education

The students were divided into two groups as control and experimental ones. The control group was taught with traditional method, while the experimental group received brain sections and studied on them. Finally, both groups attended in the same exam and their marks were compared.

4. Results

4.1. Results of 5-Scale Likert Questionnaire

4.1.1. Increased Level of Theory and its Application in Clinic

According to the results obtained from the questionnaires, level of theoretical knowledge and its application in clinics (integration between basic sciences and clinics) increased in students of the experimental group. Their ability in making relation between theoretical and clinical issues increased as well. In this part of questionnaire, 64% of students selected "very high" option. There was a significant difference between "very high" option and the others high, medium, low and weak options (Figure 7).



Figure 3. Human Brain Sagittal Sections

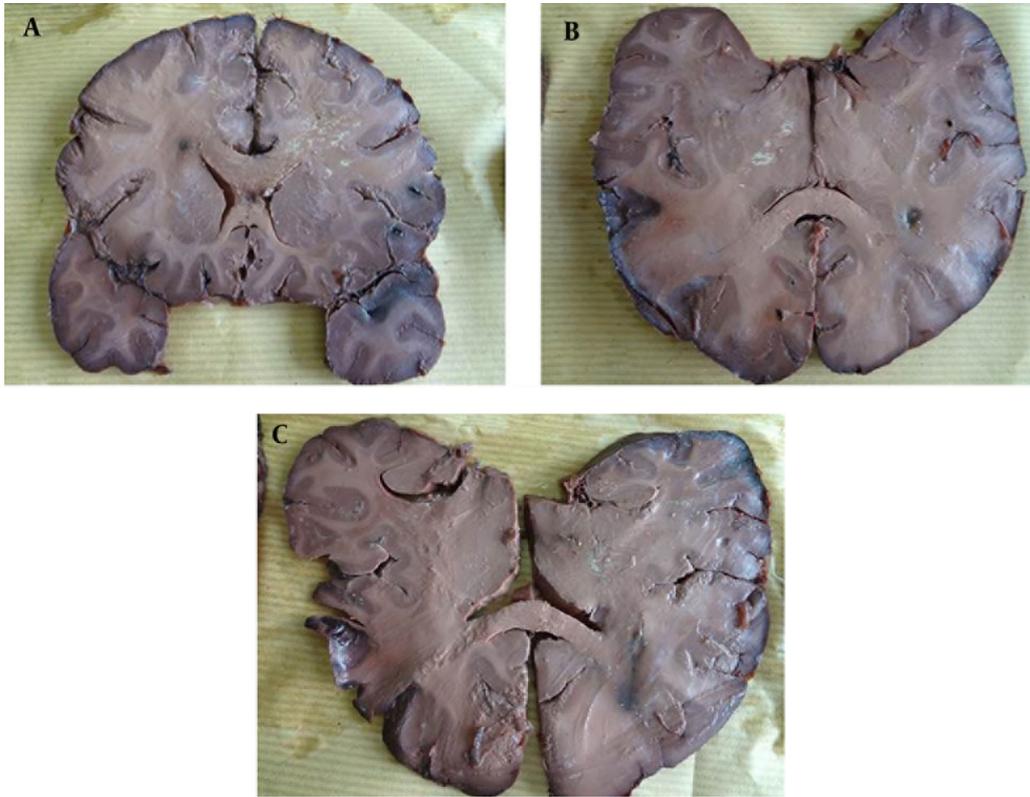


Figure 4. Human Brain Consecutive Sagittal Sections

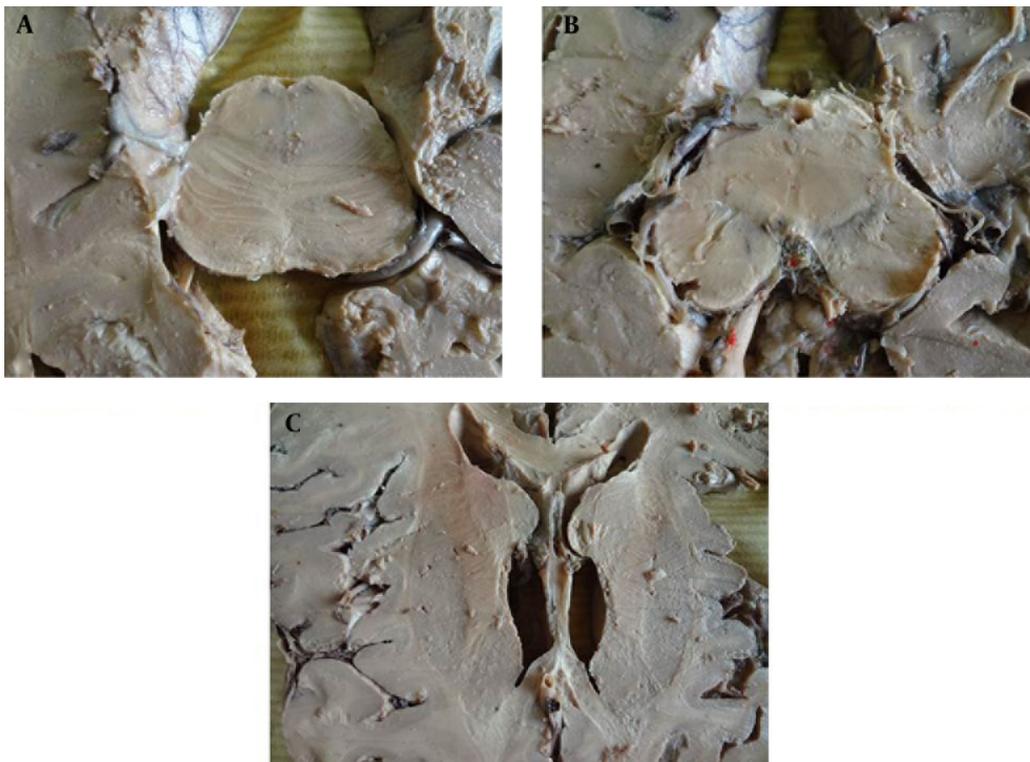


Figure 5. Human Brain Cross Sections

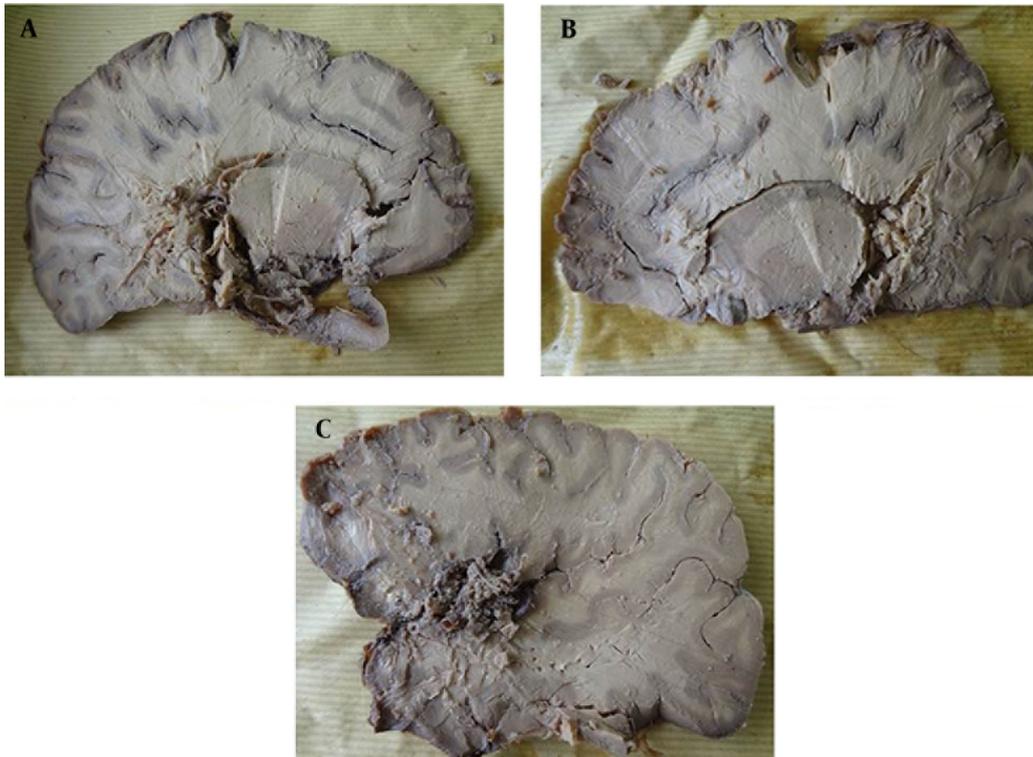


Figure 6. Human Brain Consecutive Transverse Sections

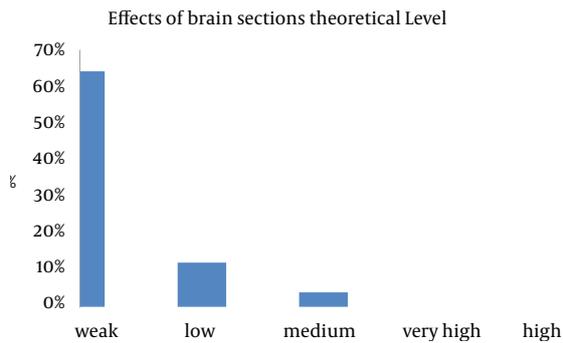


Figure 7. Students' Ideas About the Effects of the New Method on Their Theoretical Level

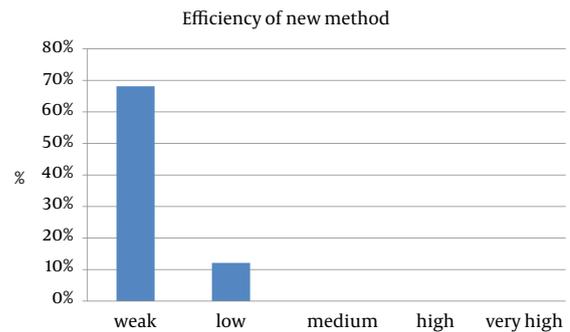


Figure 9. Students' Ideas About the Efficiency of the New Method

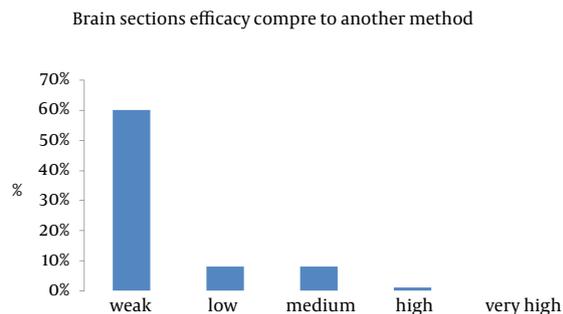


Figure 8. Students' Ideas About the Efficacy of the New Method Compared to Other Methods

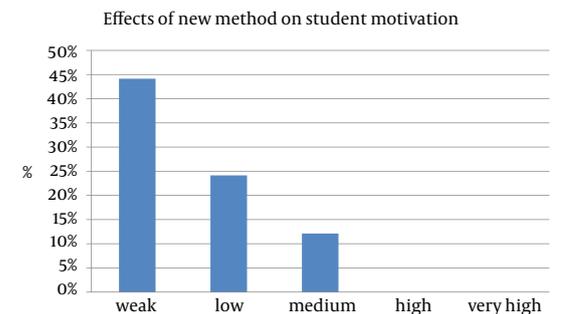


Figure 10. Students' Ideas About the Effects of New Method on Their Motivation

4.1.2. It Was More Effective Than Other Methods

In this part, 60% of students selected a “very high” option showing effectiveness of this method. There was a significant difference compared to other options (Figure 8).

4.1.3. Increase in Educational Efficiency

In this part of the questionnaire, 68% of students selected “very high” option, 12% “high” and medium, low and weak options were 0%. Therefore, it dramatically shows the educational efficiency of this method (Figure 9).

4.1.4. Increase Motivation to Study Anatomy

In this part, 44% of students selected “very high” option. 24% selected high and 12% medium (Figure 10).

4.2. Quantitative Results

Our result showed that students who studied on brain sections gained higher marks than the control group. The mean mark obtained in experimental group was 16.63 versus 15.23 in control group.

5. Discussion

As it was expected, using brain sections as a new method increased learning and motivation of students. Moreover, it decreased their stressful condition, which happens before exams as usual. Today, using advanced methods in medical education are more important. These methods include collaboration of students in teaching to using modern educational software and training equipment. It is believed that these methods undoubtedly have a marvelous effect on learning.

It is clear that neuroanatomy is a very complicated course to study and absence of assisted educational equipment disappoints students to study it (7). In modern countries, they use advanced technologies such as Internet in education. These methods always keep them on line and provide free communication with others. Therefore, they can gain easily new trainings associated with new achievements (8).

Importance of education in our country is being faded because of some problems resulted from lack of budget allocation for education. Free access to cadavers is not easy and in other hand the educational software are too expensive. Therefore, application of new methods with considering its cost-effectiveness is recommended. Based on qualitative and quantitative results obtained in the present study, using brain sections can increase students’ motivation and productivity and the time for understanding.

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Authors’ Contributions

Amaneh Mohammadi Roushandeh, Zohreh Alizadeh and Mohammad Ali Owchi wrote the manuscript. Aliehsan Saleh prepared the cadaver, Yusuf Abbasi and Marziyeh Pooladi sectioned the brains.

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