

Comparing the Traditional and Combined Methods of Teaching Neuroanatomy

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ABSTRACT

Introduction: The sectional neuroanatomy due to its great importance in identifying the internal structure of the brain seems to be a necessary course of study to the residents of the neurosurgery, neurology and neuroradiology. The aim of this study was to determine the effectiveness of the traditional and the combined methods of teaching the neuroanatomy to two separate groups of neurosurgery residents. **Methods:** At the Imam Reza hospital of the Tabriz University of the medical sciences, the efficacy of the traditional and the combined methods of teaching the neuroanatomy to two separate groups of neurosurgery residents was compared and assessed by final exams and using questionnaires. **Results:** The scores of the group B in a quite similar exam were higher than the group A. The questionnaire investigation also indicated that the combined method of teaching was more effective than the traditional method. **Conclusion:** This study also concluded that plus the traditional method of teaching the neuroanatomy, the direct observation of the serially sectioned slices of the human embalmed brain and comparing them concurrently with the similar slices of the MRI images, can raise the ability of the trainees to identify the internal structures of the brain more precisely in their medical experiences.

Introduction

It is important to understand the anatomical structure of the brain in horizontal, axial and coronal planes to examine the diseased brain as well as the normal ones.^{1,2} Despite the wide – ranging changes in medical schools curricula, dissection has still an important role to play in undergraduate and some post graduate medical educations.³⁻⁵ The magnetic resonance imaging (MRI) and the computed tomography scanning (CT scanning) which are widely used to diagnose the brain diseases are based on the serial sectioned brain slices. So, the sectional neuroanatomy seems to be a useful tool of study for the residents of the neurosurgery, neurology and the neuroradiology at the beginning of their residency educations.

The purpose of this study was to evaluate the efficacy of the traditional and the combined (Traditional + the Sectional) methods of teaching the neuroanatomy to the neurosurgery residents at Imam Reza hospital in Tabriz University of the medical sciences, Tabriz- Iran.

Methods

Neuroanatomy has been taught to two groups of neurosurgery residents by two separate methods at Imam Reza hospital in Tabriz University of medical sciences

during 10 months (January to October 2011):

1. The traditional teaching (Theoretical and practical teaching).
2. The combination of the traditional and the sectional teaching (Using the normal human brain slices) in the dissecting room of anatomy department.

The evaluation of the efficacy of these two teaching methods was based on comparing the final exam outcome and using the questionnaires.

At the beginning of the residency course of the neurosurgery, the ten residents have been divided randomly in to two groups of A and B.

At first, the anatomy of the human brain and its vasculature have been taught theoretically and then a normal embalmed brain in 10% formaldehyde was dissected and taught practically in the dissecting room of the anatomy department for the group A during 6 weeks. After that, three main sections were performed on another embalmed brain, one midsagittally, one coronally at the midpoint between frontal and occipital poles and one horizontally at the level of the lateral sulcus. The internal structures of the brain at these sections were identified and taught to the

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residents as the final step of the traditional teaching.

For the group B, first the anatomy of the brain was taught as the same way as the group A and then, as an additional teaching, 26 coronal, 8 sagittal and 12 horizontal serial sections, each 5mm in thickness have been made on the three separate normal embalmed brains with a meat slicer and each of them has been studied and compared concurrently with similar sections of MRI images.

Two weeks after the termination of teaching course, the residents of groups A and B, have been asked to name the 40 selected points of cerebral hemisphere and its internal structures in MRI brain slice images and write them down numerically on a specific exam paper. The scores of this exam were recorded for the final evaluation.

Six months later, when all the residents worked in the hospitals and studied some more CT scanning and MRI brain slice images of the patients; their opinions on the importance of the neuroanatomy knowledge in their professional work were also assessed through questionnaires. The data were analyzed using U Mann Whitney test and the values of $P < 0.05$ was considered significant.

Results

The results of the exam score was shown in table 1. As it was shown in the table 1, the mean score in group A was $25.6 \pm$ and in group B was $38.2 \pm$. Statistical analysis of the scores in two groups showed the differences between two groups were significant ($P < 0.05$).

Table 1. The scores of the two evaluated groups

Groups	No	No. Questions	Mean Score
A	5	40	$25.6 \pm$ SD
B	5	40	$36.2 \pm$ SD

$\alpha = 0.05$

P Value = 0.004

Discussion

The sectional anatomy of the brain becomes increasingly important as a response to giant strides in neuroimaging technology. It is particularly important in the brain where functional topography is utmost interest². Magnetic resonance imaging of the brain serially sectioned slices are daily studied by neuroradiologists and neurosurgeons to diagnose the brain disorders and its anatomical abnormalities. There has been much discussion about the use of dissection in anatomy teaching and both sides of the argument have considerable merit. Less widely discussed have been the other benefits of anatomical dissection, such as the development of surgical skills³. Fitzgerald et al. (2008), investigated the opinions of the newly qualified doctors at UK medical school and related them to career intention and academic performance in the setting of a traditional dissection and prosection-based course. Trainees intent on pursuing a surgical career; believed that their anatomical knowledge was insufficient. However, overall, many of responders regardless of career intention, perceived the need for greater emphasis on

anatomical teaching.⁴ Feigle et al. (2008), at Graz medical University of Australia used 96 halves of embalmed human head in four groups (24 halves per group) to evaluate the anatomical knowledge in performing safe otological surgery. This research concluded that the cadaveric training and dissection have a crucial role in improvement of the surgeon's experience and success rate.⁶ Azer, Ezenberg, (2007) at the University of Melbourne,⁷ Sprunger, (2008) at Washington State University,⁸ Bregson et al. (2008), at the University of New Mexico⁹ and many other researchers in different countries evaluated the use of the real cadaveric specimens and the pure digital images to teach the anatomy to the undergraduate medical students and the residents. In these researches it was emphasized that the combination of dissection and the digital method of teaching the anatomy is more valuable than the pure theoretical or practical and digital methods.⁹⁻¹⁶ Although, using the three dimensional images of internal body organs and the newly digital devices have improved the qualities of the methods of teaching of human anatomy, but none of them could be replaced the direct observation of the body organs by naked eyes totally.

Conclusion

This study concluded that in addition to the traditional method of teaching of neuroanatomy to the medical residents, the direct observation of the serially sectioned slices of the human embalmed brain and comparing them concurrently with the similar slices of the MRI images, could raise the ability of the trainees to identify the internal structures of the brain more precisely in their medical experiences.

Competing interests

None to be declared.

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