Original Communication

ANATOMICAL KNOWLEDGE AND DIAGNOSTIC IMAGES IN MEDICAL EDUCATION

Susana N. Biasutto*

Chair and Institute of Normal Anatomy, Faculty of Medical Sciences, Nacional University of Córdoba, Córdoba, Argentina

RESUMEN

La importancia del conocimiento anatómico para la interpretación de las imágenes diagnósticas es reconocida y aceptada. El desarrollo tecnológico basado en tomografía axial computada y resonancia magnética nuclear han incrementado los requerimientos. En nuestra Facultad, el curso de Anatomía incluye la identificación de estructuras anatómicas normales. Intentamos demostrar los resultados a largo plazo de este cambio curricular. Este estudio consideró dos grupos: A) 274 estudiantes de primer año, B) 100 médicos recientemente graduados. Ambos grupos fueron evaluados con un cuestionario sobre las mismas tomografía axial computada y resonancia magnética nuclear. En el grupo A, el 13% de los estudiantes respondió correctamente, mientras que nadie lo hizo así en el grupo B. Dos por ciento del grupo A dieron respuestas erróneas a todas las preguntas, mientras que ascendió al 26% en el grupo B. El promedio de respuestas correctas fue de 60% en el grupo A y de 45% en el B. El grupo B se subdividió en B1) aquellos graduados que estudiaron anatomía con imágenes diagnósticas y B2) quienes no lo hicieron. Las respuestas correctas del grupo B1 fue 66% y del grupo B2, 40%. Estos resultados muestran la significación del conocimiento anatómico para la identificación de las diferentes estructuras en imágenes diagnósticas. Mientras los estudiantes desarrollaban el curso de Anatomía la identificación fue más sencilla, y resultó más compleja cuando transcurrió el tiempo. Sin embargo, los resultados fueron mejores en aquellos graduados que cursaron con identificación de estructuras anatómicas en imágenes diagnósticas que en aquellos que no lo hicieron.

Palabras clave: *Anatomía, aprendizaje de Anatomía, aprendizaje de imágenes diagnósticas, curriculum de Medicina.*

ABSTRACT

The importance of anatomical knowledge for the comprehensive understanding of the diagnostic images is well known and accepted. Development of new techniques, based on computerized tomography and magnetic resonance have increased the requisite core knowledge. In our Faculty, the course of Anatomy includes the identification of normal anatomical structures in diagnostic images. We intend to demonstrate the long-term results provided by this curricular change. This study considered the following two groups: A) 274 first year medical students, B) 100 recently graduated physicians. Both groups were evaluated on their comprehension of computed tomography and magnetic resonance. In group A, 13% of the students answered all questions correctly; while 0% did in group B. Two per cent of the people in group A incorrectly answered all the questions; this percentage rose to 26% in group B. The average of correct answers in group A was 60%, while it was 45% in group B. Group B was further subdivided into B1) those graduates that studied anatomy with diagnostic images and B2) those who did not. Group B1 answered correctly on 66% of questions and group B2's correct responses were at 40%.These results showed the significance of anatomical knowledge necessary to identify the different structures in diagnostic images. Students scored better on this evaluation instrument when they were taking Anatomy, as compared to graduates who were further removed from the content. However, results were better for those graduates that had taken an anatomy course identifying the anatomical structures in the diagnostic images, than those who did not.

Key words: *Anatomy, anatomy learning, diagnostic images learning, medicine curriculum.*

* *Correspondence to:* **Susana N. Biasutto.**, Ob. Trejo 1180. 1º E. 5000 – Córdoba. Argentina. subiasutto@gmail.com

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INTRODUCTION

The importance of anatomical knowledge for the correct understanding of the diagnostic images is well known and accepted (Erkonen et al, 2000; Gunderman and Wilson, 2005; Miles, 2005; Mitchell and Williams, 2002). Development of new techniques based on computed tomography and magnetic resonance have increased the requirements.
At the end of the past century, Argentina began a movement tending to introduce the identification of normal anatomical structures in diagnostic images in the curriculum of Anatomy. At the University of Cordoba, the curriculum included those aspects for many decades, but they were not evaluated and were considered as secondary contents until 1999, when diagnostic imaging was formally taught and evaluated.
Our objective was to demonstrate the impact of training in identification of normal anatomic structures in diagnostic images during the course of Anatomy for future physicians and the level of long-term retention of those contents.

MATERIALS AND METHODS

This study involved two groups: A) 274 first year medical students at the Faculty of Medical Sciences of the National University of Córdoba, and B) 100 recently graduated physicians (up to one year following graduation).
Group A students were tested at the end of the course of Anatomy, on 2008, by a regular exam. Group B physicians were specifically tested for this study and chosen by random.
However, people in Group B had finished the medical curriculum and added the contents learned in the course of Diagnostic Images and all the subsequent clinical courses (including the studies requested for specific diagnosis.
Group B was subdivided into: B1) graduates who had taken the course of Anatomy identifying the anatomical structures in the diagnostic images and B2) graduates who had not taken the course of Anatomy with diagnostic images.
In the course of Anatomy we mainly developed those contents on conventional radiology, computed tomography and magnetic resonance.
Both groups were evaluated with the same five questions, three of them on a computed tomography of abdomen and the remaining two questions on a magnetic resonance of brain. The questions were related to the identification of normal anatomical elements that could be clearly observed: esophagus, inferior vena cava, left ureter, 4th ventricle and head of the caudate nucleus. Mentioned structures were indicated on the study and the evaluated person had to answer what anatomical element it was.
Group B was also divided into two subgroups: B1) those who had developed the course of Anatomy with identification of diagnostic images and B2) those who had not.

RESULTS

In Group A, 13% of the students answered all of the questions correctly; while 0% did in the group B. Two per cent of the people in group A gave a wrong answer to all the questions; while this percentage rose to 26% in group B. The average of correct responses in group A was 60%, while it was 45% in group B.
Sixty six percent of Group B1 submitted correct responses while 40% of group B2 gave accurate responses.
These results showed the significance of anatomical knowledge in identifying structures in diagnostic images. While the students were enrolled in the course of Anatomy, it was easier to identify them; and it was more difficult when many years had passed. However, results were better for those graduates who had taken the course identifying the anatomical structures in the diagnostic images, than those who did not.
Then, we could conclude that the course of Anatomy had direct incidence on long-term better results.

DISCUSSION

While the inclusion of diagnostic imaging contents in the undergraduate medical curriculum, and specifically in Anatomy course, are accepted and most of the universities have just incorporated them, neither the contents nor the way of teaching them have been standardized (Chowdhury et al, 2008; De Barros et al, 2001; Miles, 2005; Mitchell and Williams, 2002; Teichgräber et al, 1996). Those differences are supported by the particular characteristics of each curriculum organization, the incidence of morphological aspects on each particular study and the level of student's training to understand them. For that reason, we emphasize radiology, computed tomography and magnetic resonance, by considering them as the most representative studies to observe the anatomical structures. We also show and explain other studies but are not

tested. Teichgräber et al (1996) suggested a combined activity involving students belonging from a hands-on ultrasound workshop with others of the anatomy course, improving the understanding of clinical anatomy and introducing the students to ultrasound images. We consider that combination as necessary because adeq-uate interpretation of ultrasonographic images is "operator dependent", and only possible for us at optional courses, but not during the regular course of Normal Anatomy.

We agree with Miles (2005) in focusing on normal anatomy in early years of medicine education, without excluding the possibility of using abnormal images to reveal normal characteristics of anatomical structures (for example, abdominal gas to observe the thickness of the diaphragm or neumothorax to understand the pleural cavity).

Even if our study revealed only 45% of right answers in Group B, only the subgroup B1 (with 66% as average) could be considered as long-term retention. For Erkonen et al (1992) correct response rate in long-term tests was 74%, 14% lower than the so called "post-test" developed during the course. However, long-term tests in Erkonen study were developed 14 to 17 months after the end of gross anatomy course, while our Group B included recent graduates. Instead shorter time could determine better retention, the additional knowledge that our students managed during the following courses had positive incidence on better final results.

But the main important result was the difference obtained between the graduates that had learnt anatomy with diagnostic images (Group B1) and those who had not (Group B2) that represented the support that this experience provided for long-term retention of anatomical knowledge and for medical training in general.

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