

Anatomical Benchmarks in the Training of Gastroenterologists

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ABSTRACT

Anatomy is one of the oldest medical disciplines and offered over the centuries the morphological explanation for the structure, function and pathology of the body. Learning anatomy was one of the first steps in the accumulation of medical knowledge. Practicing gastroenterology means the approach of pathology presenting with morphological changes. Diagnosis and therapeutical interventions require also precise anatomical knowledge. This is a review of the most important anatomical benchmarks necessary to trainees in gastroenterology. Two teachers of anatomy and one resident of gastroenterology performed a literature survey. They checked the curricula of gastroenterology of continental and national societies of gastroenterology and hepatology. They also checked on Pubmed and Google Scholar pertinent journal papers. They selected and analyzed papers presenting important anatomical benchmarks considered very important for the appropriation of practical skills. A list of recommendations was the outcome of this initiative. These are largely overlapping on the available curricula. The relevant anatomical benchmarks should be used in the training programs of residents in gastroenterology. Good anatomy training enables practitioners to diagnose correctly digestive pathology, to interpret the results of the imaging or endoscopic investigations, to recommend or undertake therapeutic interventions. Although ancient, anatomy is very useful in the training of future gastroenterologists. The trainees should emphasis the learning of the most important anatomical benchmarks.

Key words: anatomy – gastroenterology – education – learning – training.

INTRODUCTION

The training of gastroenterologists is very important and regulated by international and national guidelines. While differences still exist between different countries, the purpose to standardize and unify the certification of gastroenterologists remains very important [1]. In Europe, the European Section and Board of Gastroenterology and Hepatology (ESBGH) of the European Union of Medical Specialists (Union Européenne des Médecins Spécialistes; UEMS) has elaborated a working document recommending the competences considered to be needed by young gastroenterologists, the so-called

„Blue Book” [2]. The guidelines included in this multiauthor Blue Book should lead to a common European certification exam, for the moment accepted by some countries (UK, Netherlands, Switzerland). Recently, the European Societies of Gastrointestinal Endoscopy (ESGE) and of the Nurses of Gastroenterology and Endoscopy (ESGENA) elaborated a position paper [3]. This document includes a decalogue of recommendations for the trainees in gastrointestinal endoscopy, strongly requiring good knowledge of anatomical structures as background.

In the United States, the training in gastroenterology follows a different pathway and is longer. Here, both the American College of Gastroenterology and the American Gastroenterological Association have created and endorsed numerous programs for trainees. These programs offer more flexibility than in Europe and are also dedicated to subspecialties [4]. In a similar way, Australia certifies gastroenterologists after admission by the Royal Australasian College of Physicians into a fellowship in gastroenterology. The Asian Pacific Association of Gastroenterology offers also training possibilities in gastroenterology.

In Romania, the training of gastroenterology is regulated by the Ministry of Health in cooperation with the Romanian

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Society of Gastroenterology and Hepatology. The content of the curricula is similar to the European one [5].

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As in other medical specialties, in gastroenterology the practitioners need also to know very well gross anatomical anchors to use in diagnosis and therapy, including invasive interventions.

Indeed, the development of gastroenterology (intended here also hepato-biliary-pancreatology) was always linked to the progress of anatomical knowledge.

Even in the first medical document, the Ebers papyrus (3500 years old, conserved in Leipzig), there are first mentions of anatomy notions of the digestive system, focusing, among others, on the intestinal worms and on the liver [6] (Fig. 1).

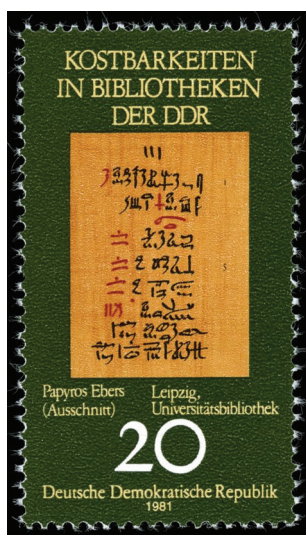


Fig. 1. Ebers Papyrus on a postal stamp of the German Democratic Republic.

During the flourishing of medical science of the Greek and Roman civilizations, teaching anatomy was considered very important and Galenus is an outstanding figure to represent physicians working upon anatomical knowledge [7].

The same trend continued via Arabic medicine to the Middle Age, when dissection became more frequent in Italy and the study of the human body became an important part of the medical training. Fig. 2 displays the famous amphitheater from Padova, the first in the world dedicated to dissections.

Here were several anatomical discoveries performed, including the discovery of the duct of Wirsung by Johan Georg Wirsung [8]. Here worked also Giovanni Battista Morgagni, who used to offer his experience to clinicians, for their practice [9]. But before him, Vesalius presented to the medical world, in his book *De humani corporis fabrica* published later in several editions, the gross anatomy of the digestive organs. Fig. 3 shows the abdominal viscera according to Vesalius.

The advent of new imagistic techniques in the last few decades, as well as the advances of endoscopic techniques require a very good background of anatomical training. This is necessary not only for the management of organic diseases,



Fig. 2. The anatomical amphitheater in Padova (photo Irina Magurean).

but also for the functional pathology. Indeed, the disorders of gut-brain interactions are now entities based on their own diagnostic criteria, no longer considered the Cinderella of gastroenterology [10]. Thus, their understanding requires also good anatomical knowledge.

Anatomical Benchmark for Gastroenterologists

We undertook a survey on Pubmed and Google Scholar, as well a survey of the training curricula for gastroenterology in several countries, that we could retrieve on internet and published in one of the languages of wide circulation. We compiled a list with anatomical benchmarks that in our opinion should be taught to all gastroenterology residents or fellows, based on the requirements of these curricula (Table I). The curricula were similar and in concordance with the Blue Book [2.]

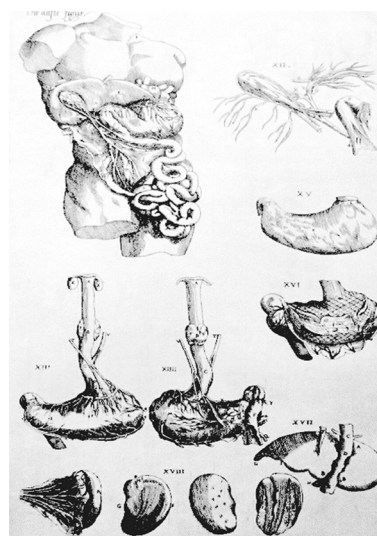


Fig. 3. Vesalius Andreas: *Anatomia Deudsch*. Ein kurtzer Auszug der beschreibung aller glider menschlichen Leybs aus den Buchern des hochgelerten Herrn Dr. Andreas Vesalius. Reproduction after original from 1551. Private collection.

Table I. Main anatomical benchmarks in the training of gastroenterologists

Main anatomical benchmark	Clinical application
Lower esophageal sphincter	Pathology of gastroesophageal junction; achalasia
Stomach and pylorus	Organic, motility and functional gastroduodenal pathology
Sphincter of Oddi, Ampulla Vater	Biliopancreatic pathology
Ileocecal valve	Colonoscopy, cecal and terminal ileal pathology
Anal internal and external sphincter	Anorectal pathology
Liver segmentation	Description of liver nodular pathology, liver surgery, tumor ablations
Biliary system	Biliary pathology

Nowadays, when trainees are mainly interested in very practical aspects of their training, i.e. endoscopic and imagistic driven interventions, gastroenterologists should be well familiarized with several anatomical reference points.

We consider these benchmarks of tremendous importance, but any good gastroenterologist should have a comprehensive and extensive knowledge on the whole gastrointestinal tube, liver plus biliary system, and pancreas. Knowledge of gross anatomy should be associated to histological knowledge, mainly in the period of acquiring advanced endoscopic techniques. Anatomic training offers also to practitioners and surgeons the possibility to investigate and prevent side effects of their interventions [11].

Given the relative closeness between anatomy, an ancient scientific discipline, and humanities, we can claim that, like in the case of humanities, gastroenterology fellows appropriating anatomical notions are better able to increase their professional performance [12].

Challenges of the Anatomical Teaching for Gastroenterologists

For the teachers of anatomy to medical students, it is important that they are able to stimulate in their fellows the appetite to learn all the anatomical structures and injuries, explaining them that their professional success will be associated with their background of general knowledge on the morphological alterations produced by diseases [13].

There is not only a need to offer the best anatomical information to students which should be useful in their activity, but teachers themselves should contemplate the content of the curricula they use and how they teach. Indeed, for the progress of gastroenterologists’ knowledge on visceral anatomy, the quality of textbooks and lectures should be very high [14].

In contrast with the need to offer more anatomical knowledge, there are also signs that some of the medical graduates, including potential gastroenterologists, are less interested by learning anatomy. Unfortunately, it has been reported a decline in the recognition by students and trainees of anatomical parts [15]. This finding put pressure on the professors of anatomy who should act for the revival of the interest in anatomy of the recent generations of doctors.

This finding is however disputed by other papers showing that medical students are keen to study anatomy, being aware of its importance. They prefer even cadaveric studies, despite more alternatives available [16] including distance teaching [17], virtual simulation [18] or artificial intelligence [19]. Thus, the education of anatomy is evolving [20] and needs a continuous adaptation to the needs of future gastroenterologists as well as to the new diagnostic and therapeutic tools. On the other hand, many teachers feel that we do not teach enough anatomy and that we should offer more teaching hours for the study of anatomy [21].

What kind of anatomy should be taught in medical universities? Decidedly both teachers and students prefer the transfer of that knowledge that is useful for daily practice [22]. Given the importance of anatomy in the medical education and given the fantastic advances of teaching methods, including audio-visual media that few decades ago were considered impossible, the classical anatomy professor have to adapt themselves to the landscape changes of medical education [23].

In recent decades, several proposals to improve the training in digestive disease have been presented. All emphasize the need to probe the clinical skills and to offer a good morphological knowledge as background to future gastroenterologists [24].

Thus, ultrasonography was included in the education: it is a perfect tool to simplify the access of trainees but even of medical students to the “real life” structure of different viscera and topographic regions. In diverse settings was evaluated the role of ultrasonography in medical and specifically gastroenterological education and all data agree on the advantages of the use of ultrasonography from the first years of medical training [25-29].

The need to teach anatomy for gastroenterologists is recognized also in countries with emerging medicine. Anatomy is considered the background of the understanding of pathologic conditions and of learning the diagnostic and therapeutic procedure [30]. Indeed, all major textbooks of gastroenterology include pages dedicated to anatomy, which are sometimes very detailed [31]. The teachers educating gastroenterologists in morphological sciences are aware of its importance. Even the nomenclature of gastroenterology starts with anatomists, thus, personalities like Moellenbrock, Boerhaave or Cheselden used the word enterologia almost simultaneously; they also used the term gastrodilogia from older Latin textbooks [32]. The modern education of future gastroenterologists includes the description of all organs of the gastrointestinal tract, of the liver, biliary system and pancreas [33-38]. Knowledge of embryology is also necessary and should be added in the teaching activities.

The future

Futurology is a difficult science. However, in the field of anatomy, the advent of artificial intelligence is of tremendous importance in teaching activities for the use of gastroenterologists. There are many studies showing how artificial intelligence can support not only the teaching, but also the practice in the management of digestive diseases. Artificial intelligence is applied to numerous fields of gastroenterology, based on the capacity to recognize diverse morphological particularities or pathological alterations. The application of artificial intelligence

is now available in almost all fields of gastroenterology [39–41], and this will influence also the way young gastroenterologists will learn and recognize structural changes.

Another direction will be the expansion of virtual teaching; this manner will overcome distance from faculty to participants, travel and logistic costs, and will contribute to the global standardization of practice. A large panel of experts of the World Gastroenterology Organization has very recently agreed on the importance of virtual education [42].

CONCLUSIONS

The anatomy of the digestive system forms the foundation of the knowledge required for any gastroenterologist. A deep understanding of anatomical landmarks is essential for the effective diagnosis and treatment of gastrointestinal disorders. For young gastroenterologists, mastering the anatomical details of the digestive system is crucial for the effective diagnosis and management of gastrointestinal disorders. From the oral cavity to the rectum, each segment of the digestive tract has unique anatomical and physiological characteristics that influence clinical signs, investigations, and therapeutic interventions. A deep understanding of these anatomical benchmarks not only facilitates treatment but also contributes to a better understanding of associated pathologies and improves clinical outcomes.

Conflicts of interests: None to declare

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