EVIDENCE-BASED APPROACH IN ANATOMYAND ITS APPLICATIONS

Abstract

Anatomy is not regarded as a field that is driven by research; rather, it is a basic medical science that describes things. One prominent category of clinical anatomy literature is prevalence studies, which look at clinically relevant anatomical differences and record their frequencies and/or connections with things like age, sex, side, laterality, and ancestry. The need to comprehend existing literature is discussed in this article. A unique concept termed evidence-based anatomy (EBA) is suggested to identify, assess, and synthesize the findings detailed in these studies. It entails using methods for evidence synthesis, such as meta analysis and systematic reviews, to offer weighted pooled data in the study of epidemiological anatomy. Large pooled sample sizes are more likely to yield pooled frequencies and associations that closely resemble real population statistics and are more reliable. Examined include the importance of EBA for current practice and prospective research, as well as its reach. It's also advised to use a checklist for a typical anatomical systematic review. The EBA technique would help maintain anatomy's status as a core basic science, ensure that anatomical variances are accurately understood, and ensure the safety of medical practice.

Keywords: Anatomical variations, Evidence based anatomy, Epidemiological anatomy, Meta analysis, Systematic reviews.

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I. INTRODUCTION

The subsequent subject of anatomy builds on the previously learnt information. A lack of structural knowledge may have an impact on future understandings of function and dysfunction, as well as knowledge and skills relevant to treatment methods.

The availability of contact hours for this essential subject in a hectic college curriculum has been steadily reducing, according to general consensus. Some people think that gross anatomy is a devalued discipline because it is no longer viewed as a research-driven field. Case reports of an aberration or a condition, prevalence studies using cadavers or radiological data, or descriptions of novel surgical techniques make up the majority of "anatomical" publications seen in clinical journals. The new idea of evidence-based anatomy is introduced in this article. It refers to the application of evidence-based techniques, namely evidence synthesis through systematic reviews (SR), to the study of anatomy.

II. ANATOMICAL VARIATIONS

The history of human anatomical variations is deeply intertwined with the development of the field of anatomy itself. As Sanudo et al. (2003) assert, the study of anatomical variations is essentially the history of anatomy. From the ancient observations of anatomical structures to the groundbreaking work of Vesalius and beyond, anatomical variations have been a recurring theme in the advancement of anatomical knowledge.

Vesalius, often regarded as the father of modern anatomy, made significant contributions to the understanding of anatomical variations through his renowned publication, "De Humani Corporis Fabrica" in 1542. This masterpiece highlighted not only the typical anatomical structures but also various allusions to deviations and variations in human anatomy.

Over time, the recognition and documentation of anatomical variations have become increasingly important. However, defining the boundaries of normality can be challenging, as there is considerable variability between individuals. It took several decades for a comprehensive compendium of human anatomical variations to be published, marking progress in understanding the diverse aspects of human anatomy.

Anatomical variations encompass a broad range of characteristics, including morphometric (size and shape), consistency (presence, absence, or multiplicity), and spatial (location and orientation) variations. These variations can have significant clinical implications, affecting patient care and surgical outcomes.

In clinical practice, understanding anatomical variations is crucial for ensuring patient safety and optimal treatment. For example, knee implant manufacturers design prosthetics considering sex, ethnicity, and size differences. The anatomical variability of the cystic artery is recognized as essential for the safety of laparoscopic cholecystectomy.

Failure to recognize anatomical variations can lead to medical errors and medico-legal claims. Ignorance of anatomical variance has been estimated to be responsible for about 10%

of clinical misconduct. Some mistakes in surgical practice may not have immediate clinical consequences but still indicate a lack of anatomical knowledge.

Overall, anatomical variations are an integral part of anatomy training, and a thorough understanding of these variations is essential for medical professionals to deliver safe and effective healthcare. Continual improvement in methods for analyzing anatomical variances, as well as ongoing research and education, will contribute to the advancement of the field of anatomy and ultimately benefit patient care.

III. EVIDENCE BASED PRINCIPLES

The concept of evidence-based principles (EBP) originally emerged within the context of evidence-based medicine (EBM), which emphasizes the systematic integration of the best available scientific evidence, clinical expertise, and patient preferences in making healthcare decisions for individual patients. EBM aims to ensure that medical practices and interventions are founded on solid evidence, improving patient outcomes and optimizing healthcare delivery.

Over time, the evidence-based movement has grown exponentially and expanded its influence beyond medicine. The principles of EBP have been widely adopted in various fields, including allied health therapies (such as physical therapy, occupational therapy, and speech therapy), sociological and educational research, business management, and even conservation biology.

In allied health therapies, EBP is used to inform treatment approaches and interventions, ensuring that therapeutic practices are evidence-based and effective. This approach promotes better patient outcomes and encourages continuous learning and improvement among allied health professionals. To achieve a high standard of evidence synthesis, an SR identifies, assesses, and selects the evidence that is present in the literature and concentrates on a particular field of research. SRs have increasingly replaced conventional narrative reviews and expert opinions in order to provide factual summaries.

The objective is to identify, evaluate, and synthesize the findings of the best research that is currently accessible on a certain topic using precise, standardized procedures. The data of qualifying studies are typically, but not always, combined using a statistical method known as pooling to obtain a pooled estimate that reflects the overall weighted average of the effect estimates from the included studies in relation to sample size.

IV. EVIDENCE BASED ANATOMY

Evidence-based anatomy refers to the practice of utilizing scientific research and empirical evidence to understand the structure and function of the human body. In this approach, anatomical knowledge is derived from rigorous studies, systematic reviews, and meta-analyses, ensuring that conclusions are based on objective data rather than tradition or subjective opinions. By relying on evidence, anatomists and medical professionals can make informed decisions about patient care, surgical procedures, and medical education. One of the primary sources of evidence in anatomy is medical imaging, such as computed tomography (CT) scans, magnetic resonance imaging (MRI), and ultrasound. These technologies provide

detailed visualizations of internal structures, aiding in the identification of anatomical variations and pathologies.

Furthermore, anatomical studies involving cadavers or living subjects, coupled with advanced statistical analyses, enable researchers to explore inter-individual variations and create population-based anatomical atlases. This approach is crucial in understanding the normal range of anatomical variations and guiding clinical decision-making.

Evidence-based anatomy also extends to surgical interventions. Surgeons rely on well-documented evidence when planning procedures, considering factors like anatomical variations, success rates, and potential complications. This approach enhances patient safety and outcomes while minimizing risks.

Medical education benefits significantly from evidence-based anatomy. By incorporating research findings into curricula and teaching methods, educators can foster a better understanding of the human body among students. This approach also promotes critical thinking and analytical skills essential for evidence-based medical practice.

Despite its numerous advantages, evidence-based anatomy faces challenges. The scarcity of well-designed studies and the time-consuming nature of research can hinder its widespread implementation. Additionally, anatomical variations among populations and the dynamic nature of the human body make it challenging to have a one-size-fits-all approach.

In conclusion, evidence-based anatomy is a vital aspect of modern medicine and healthcare. By grounding anatomical knowledge in scientific evidence, medical professionals can make informed decisions, enhance patient care, and improve medical education, ultimately contributing to better health outcomes for individuals and communities.

1. **Applications of Evidence Based Anatomy:** Evidence-based anatomy has numerous applications across various fields in healthcare and medical research. Some of the key applications include:

    - **Clinical Decision-Making:** In medical practice, evidence-based anatomy guides clinicians in making accurate diagnoses and treatment plans. Understanding the variations in anatomical structures helps physicians interpret medical imaging results more effectively, leading to better patient outcomes.

    - **Surgical Planning:** Surgeons rely on evidence-based anatomical knowledge when planning and performing surgical procedures. Knowing the variations in anatomy allows for safer and more precise surgeries, reducing the risk of complications and improving surgical success rates.

    - **Medical Education:** Evidence-based anatomy is integrated into medical education curricula to provide students with a solid understanding of the human body. This approach promotes critical thinking skills and ensures that future healthcare professionals base their practice on scientific evidence.

- **Anatomical Research:** Researchers use evidence-based approaches to investigate anatomical structures and functions. By conducting systematic reviews and meta-analyses, they can identify gaps in knowledge, explore variations, and propose new research directions.

- **Biomarker Identification:** In fields like radiology and pathology, evidence-based anatomy helps identify reliable anatomical markers for diagnosing diseases and monitoring treatment responses. These biomarkers enhance early detection and facilitate personalized medicine.

- **Prosthetics and Implants:** Knowledge of evidence-based anatomy is essential for designing and fitting prosthetics and implants accurately. Understanding anatomical variations ensures that these devices align with individual patients' needs and anatomies.

- **Forensic Medicine:** In forensic investigations, evidence-based anatomy aids in identifying and interpreting injuries, trauma, and post-mortem changes. It is crucial for accurate post-mortem examinations and providing evidence in legal proceedings.

- **Rehabilitation and Physical Therapy:** For patients undergoing rehabilitation, evidence-based anatomy helps therapists understand individual anatomical variations, leading to more targeted and effective treatment plans.

- **Population Health Studies:** By considering anatomical variations among different populations, evidence-based anatomy contributes to understanding health disparities, genetic influences, and the impact of environmental factors on human health.

- **Medical Device Development:** Manufacturers of medical devices, such as surgical instruments and diagnostic tools, rely on evidence-based anatomy to ensure their products are safe, efficient, and suitable for diverse patient populations.

2. The Potential of Evidence Based Anatomy

- **Implications for Practice:** Absolutely, in this era of advanced healthcare and the pursuit of medical excellence, evidence-based anatomy (EBA) becomes even more crucial for the effectiveness of patient therapies and overall medical practice. As medical knowledge continues to expand, having a comprehensive understanding of anatomical structures and their variations is essential for providing high-quality patient care.

  The EBA approach plays a significant role in medical education, particularly when teaching medical students and residents. By focusing on clinically important anatomical variants, especially in surgical specialties and diagnostic/interventional imaging, EBA equips future healthcare professionals with the knowledge needed to make accurate diagnoses and perform successful procedures. This not only enhances patient outcomes but also fosters critical thinking and evidence-based decision-making skills among medical practitioners.

Anatomical variations are not uniform across populations; they can be influenced by various factors such as age, sex, and ethnic heritage. Emphasizing the prevalence of certain mutations or anatomical differences in different population groups becomes essential for doctors worldwide. Understanding these variations can lead to personalized medical approaches, better patient management, and culturally sensitive healthcare practices.

Moreover, evidence-based anatomy benefits any collection of anatomical variants by providing descriptive data and prevalence statistics. This comprehensive approach helps researchers, clinicians, and medical device manufacturers to stay informed about the range of anatomical variations, enabling them to develop tailored therapies and interventions. This data-driven knowledge ensures that medical professionals can adapt their practices to suit individual patient needs, optimizing treatment outcomes.

- **Implications for Research:** Indeed, the quality of systematic reviews (SRs) heavily relies on the availability of high-quality prevalence studies. When conducting SRs, researchers aim to synthesize all relevant evidence to provide a comprehensive and reliable overview of a particular topic. If there is a lack of high-quality prevalence studies, the results and conclusions of the SR may be limited or biased. Writing protocols before initiating a prospective study is crucial as it helps researchers plan and organize the study effectively. By outlining the study's objectives, methods, and data collection procedures in advance, researchers reduce the likelihood of overlooking crucial data and ensure that all relevant information is captured for subsequent analysis. This systematic approach enhances the reliability and validity of the study's findings.

  Meta-analysis (MA) is a powerful statistical tool used by epidemiologists to combine data from multiple studies and derive more precise estimates of prevalence or effect sizes. By pooling data from different sources, MA provides a more robust and generalizable picture of the phenomenon under investigation. This can be particularly beneficial for comparing prevalence data across different populations or time periods, enabling researchers to identify trends and patterns.

  The results obtained from general and subgroup pooling in MA can validate or refute previous findings from individual studies. This validation process strengthens the evidence base and contributes to building a more solid foundation of knowledge in a particular field. As a result, these findings often become frequently cited and used as references in scientific papers and reference books.

  In addition to providing prevalence data, evidence synthesis through MA allows researchers to evaluate various etiological theories, such as genetic, functional, or environmental factors. By systematically analyzing and integrating data from multiple studies, researchers can gain a better understanding of the potential relationships and contributions of these factors to the observed outcomes.

  In summary, evidence synthesis techniques like systematic reviews and meta-analysis play a crucial role in advancing scientific knowledge. By relying on high-

quality prevalence studies and systematic data collection, researchers can produce more robust and reliable results, which can have a significant impact on medical literature, reference materials, and the evaluation of etiological theories.

3. **The Future Scope of Evidence Based Anatomy:** The scope of evidence-based anatomy (EBA) is indeed vast, encompassing various branches of anatomy, including gross anatomy, microscopic anatomy, surface anatomy, surgical anatomy, and developmental anatomy. EBA's application in osteo-archaeology, as illustrated by the systematic review on the prevalence of os acromiale, demonstrates its potential benefits in providing a comprehensive understanding of anatomical variations and prevalence from different research approaches.

   One of the advantages of EBA is its potential to foster interdisciplinary research. Anatomists can collaborate with experts in various fields such as pathology, kinesiology, biomechanics, functional anatomy, physical anthropology, biological anthropology, and biodistance. This collaboration can lead to innovative research projects and a deeper understanding of anatomical structures' functional and evolutionary aspects.

   Furthermore, EBA can facilitate closer cooperation between anatomists and physicians. By basing medical practice on scientific evidence, clinicians can make more informed decisions and deliver better patient care. This collaboration may result in improved patient outcomes and the development of more effective medical treatments and procedures.

   EBA's emphasis on systematic reviews can also reignite interest in the study of anatomy. By consolidating existing knowledge and providing a comprehensive overview of research findings, systematic reviews can inspire new researchers and educators to engage in anatomical studies and contribute to the field.

   As EBA gains momentum, it is likely that anatomical journals will establish dedicated evidence-based review sections to promote and expand EBA further. This development can provide a platform for researchers to share evidence-based findings, thus encouraging more scientists and anatomists to adopt EBA in their work.

   In epidemiological anatomy research, meta-analysis (MA) of prevalence studies will play a significant role in advancing knowledge. By combining data from multiple studies, MA provides more precise estimates of prevalence and contributes to a more robust evidence base for medical practice and research.

   In conclusion, evidence-based anatomy holds great promise for the future of anatomical research and medical practice. By encouraging systematic reviews, fostering interdisciplinary collaboration, and promoting the use of meta-analysis, EBA can revolutionize the way anatomical studies are conducted. This approach has the potential to benefit both the scientific community and patient care, ultimately advancing our understanding of the human body and its variations.

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