**EVIDENCE-BASED APPROACH IN ANATOMYAND ITS APPLICATIONS**

*1Sandhya Nagolu, Assistant Professor, Department of Anatomy, School of Health Sciences, Garden City University, Bangalore, Karnataka.*

**ABSTRACT**

Anatomy is a basic medical science that describes things; it is not thought of as a research-driven field. Prevalence studies, which examine clinically significant anatomical differences and record their frequencies and/or relationships with factors including age, sex, side, laterality, and ancestry, are a common type of clinical anatomy literature. This article talks about the need to understand the literature that is already out there. To identify, evaluate, and synthesize the findings described in these papers, a novel idea called evidence-based anatomy (EBA) is proposed. It involves employing evidence synthesis techniques like systematic reviews and meta analysis to provide weighted pooled results in the field of epidemiological anatomy research. Large pooled sample sizes are more likely to produce pooled frequencies and relationships that are more accurate and closely approximate genuine population statistics. The significance of EBA for practice and upcoming research, as well as its scope, are examined. A checklist of a typical systematic review in anatomy is also recommended. The EBA method would benefit the future maintenance of anatomy as a fundamental basic science, accurate understanding of anatomical variations, and the security of medical practice.

**INTRODUCTION:**

The knowledge that is learned is then expanded upon in the sequential subject of anatomy. The future comprehension of function and dysfunction, and eventually the knowledge and abilities pertaining to treatment approaches, might all be impacted by a lack of structural information.

There is widespread agreement that the availability of contact hours for this fundamental subject in a packed undergraduate curriculum has been steadily declining (General Medical Council, 2003; Smith, 2005; Tibrewal, 2006; Fitzgerald et al., 2008). Because gross anatomy is no longer seen as a research-driven field, some people believe it to be a devalued science (Dyer and Thorndike, 2000; McLachlan and Patten, 2006). The bulk of "anatomical" publications published in clinical journals are case reports of an aberration or a condition, cadaveric or radiological prevalence studies, or descriptions of new surgical approaches. This article introduces the new concept of evidence-based anatomy: the application of evidence based principles, largely evidence synthesis via systematic reviews (SR), to the field of anatomy.

**Anatomical Variations:**

According to Sanudo et al. (2003), the history of human anatomical variants is the history of anatomy. I would also add that the future of anatomy depends on new techniques for examining anatomical variations. Due to his publication De Humani Corporis Fabrica (Vesalius, 1542 [quoted in Garrison and Hast, 2003]), which contains several allusions to anatomical variances, Vesalius is recognized as the second person after Galen to have invented modern anatomy (Straus and Temkim, 1943; Hast and Garrison, 2000). In fact, defining the limits of normality is challenging, and a compendium of human anatomical differences was not published until several decades of data had been made (Bergman et al., 1988, 2002). The journal Clinical Anatomy's editorial board made progress in 2006 by indexing and publishing uncommon anatomical variations (Carmichael, 2006). However, as is well known, there are differences in the anatomy of organisms within each species, and this is true, among other things, of humans. The range of anatomical variations therefore includes "normal" variation across people as well as deviations or aberrations. Therefore, anatomical variations must be regarded as a crucial component of anatomy instruction; familiarity with typical variations reflects the capacity to understand the varied clinical realities of anatomy. Grossly speaking, there are three different types of anatomical variations: morphometric (size and shape), consistency (existence, absence, or many), and spatial (proximal/distal or right/left bifurcation, artery supply, etc.). There are several such clinically relevant anatomical differences. For instance, whole knee implants are created by knee implant manufacturers based on sex, race, and size disparities in addition to size variances. Another example of vulnerability to injury during surgical procedures is provided by the numerous anatomical variables linked with median nerve anatomy and the reasons for its compression (Beris et al., 2008; Khan and Giddins, 2010; Bruser, 2011; Budhiraja et al., 2012). Laparoscopic cholecystectomy safety has been seen as requiring knowledge of the anatomical variability of the cystic artery (Ding et al., 2007). Additionally, inadequate anatomical knowledge has been related to an increase in some medico-legal claims, many of which have been associated with "injury to underlying structures" and seen as a danger to patient safety (Ellis, 2002; Regenbogen et al., 2007). According to Cahill and Leonard (1999), 10% of clinical malpractice is brought on by anatomical variance ignorance. Many people believe that malpractice resulting from inadequate anatomical knowledge is underreported because not all "anatomical" complications are documented (Kernt and Neu, 2011), and even when they are, they may not always be reported or published (Leppaniemi and Clavien, 2013; Slankamenac et al., 2013). In addition, some surgical "mistakes" in clinical practice do not result in clinical complications, such as an iatrogenic injury to the radial artery during the placement of an anterior plate for distal radius fractures using a distal "Henry" approach, but they do reveal a lack of anatomical competency.

**EVIDENCE-BASED PRINCIPLES**

Evidence-based medicine (EBM), which is described as "the conscious, explicit, and prudent use of current best evidence in making decisions regarding the care of individual patients," is the term that first applied to evidence-based principles (EBP) (Sackett et al., 1996). Since its origin, the evidence-based movement has been extremely well-known and played a significant role in nearly every part of medicine, as well as other disciplines like allied health therapies, sociological and educational research, business management, and conservation biology (Ader et al., 2008).

According to the Evidence-Based Medicine Working Group (1992), the concept of EBM is typically based on the stratification of five levels of evidence, known as the evidence hierarchy, ranging from meta-analyses (MA) with homogeneous results of high-quality Level I randomized controlled trials (RCT) to expert opinion—Level V. Between these two extremes are study types include quasi-randomization, prospective and retrospective comparative, case control, and case series investigations. For interventional assessment in particular, systematic reviews (SR) of high-quality RCTs are at the top of the evidence hierarchy, while reviews of "lesser" study designs are viewed as having lower levels of evidence.

A SR is described as a review that focuses on a specific area of research and identifies, evaluates, and chooses the evidence that is present in the literature to produce a high standard of evidence synthesis. In order to summaries the facts, SRs have increasingly taken the place of traditional narrative reviews and expert opinions. The goal is to discover, assess, and synthesize the results of the finest research that is currently available on a certain subject using clear and repeatable set protocols. In order to get a pooled estimate that reflects the overall weighted average of the effect estimates from the included studies in proportion to sample size, the data of eligible studies are frequently, but not always, combined using a statistical technique called meta-analysis.

**EVIDENCE-BASED ANATOMY**

In the past, Vesalius work went beyond only recording the differences he came across or examined. He also made an attempt to determine how common these variants were in people by using "subjective statistics."

Vesalius' book contains many expressions that can be translated as "always," "usually," "frequently," "more frequently," "most frequently," "sometimes," "not always," "rarely," "relatively rarely," "much more rarely," and "very rarely," according to Straus and Temkin (1943) [cited in Sanudo et al. (2003)]. When certain clinicians and anatomists published frequencies and subgroup rates of anatomical conditions at the end of the 18th century, basic descriptive statistics were first used in anatomical studies (Pfitzner, 1892; Fawcett, 1896; Thilenius, 1896). Since then, publications on anatomy have routinely used the complete spectrum of descriptive and inferential statistics. However, the majority of those papers are transversal studies, sometimes referred to as cross-sectional or prevalence studies, in which frequency data are gathered at a single point in time. Apart from investigations of the effects of surgical techniques on patient outcomes, RCTs do not have a place in clinical anatomy, and case-control studies are exceptional, thus a study design like this is of interest for epidemiological research in anatomy.

The phrase "evidence-based anatomy" could seem like an odd combination of words. However, morphometric, and epidemiological studies of anatomical structures include (a) measurements with their descriptive statistics used to define the "normal" range of morphometric variation, (b) frequencies to assess inconsistent structures, and (c) basic inferential statistics to look for associations with variables or differences among groups. It is true that anatomy is a "dry" descriptive basic science. Means with standard deviations, prevalence, and odds ratios are the major types of data that are produced from observational anatomical investigations.

To provide weighted pooled estimates, such data gathered from studies matching predetermined inclusion criteria would be subjected to meta-analysis. Results obtained from a sizable, pooled sample are thought to be more reliable and reflect actual population statistics. Thus, the findings of anatomical prevalence studies that have undergone meta - analysis are considered as the basis of EBA.

**APPLICATIONS OF EVIDENCE BASED ANATOMY:**

Anatomy's evidence-based concepts could be used to improve observational study design and carry out systematic reviews. In fact, while conducting our "anatomical" SRs, we were shocked by the number of studies describing the prevalence of a condition with inadequate reporting of: (a) baseline characteristics of subjects, such as age, sex, or side of the condition; (b) study characteristics, such as retrospective or prospective design; (c) the diagnostic tools, such as the radiographic views used to diagnose the condition; and/or (d) outcomes of interest, such as side-based or sex-based frequency.

There is undoubtedly space for improvement, and editors ought to urge researchers to share such information whenever it is feasible.

Researchers would conduct prospective studies using planned and well-considered designs if they used an EBA strategy.

But in my opinion, efforts shouldn't be restricted to documenting novel variations or their prevalence in a particular community. It's time for the science of anatomy to embrace the push for evidence-based medicine. Making sense of what has been published is necessary, and evidence syntheses like SRs and MA could help with this. Since there are many previous studies in the literature nowadays, it is worthwhile to use meta-analytical approaches to estimate frequency more precisely in connection to anatomical parameters.

The first published SRs and MA carried out in our Center for Evidence-Based Sports and Orthopedic Research (CEBSOR) produced overall and subgroup prevalence values on bone structures like the os acromiale and the sesamoids in the hands, as well as on muscle agenesis like the Palmaris Longus.

Additionally, data analysis produced quantitative evidence that supported one etiological explanation over another. For example, all of our analysed disorders were shown to have a genetic rather than a functional foundation. Apart from the aforementioned publications, I'm not aware of any other literature that has explained or applied evidence-based concepts to anatomy, at least not in a systematic way.

I must stress the importance of the pooled MA results because they do not represent dogma or the actual population prevalence of the ailment being examined. The conclusions reached from the MA results are interpretations of the best available evidence at the time the SR was completed; a pooled result is a best estimate.

**THE POTENTIAL EVIDENCE-BASED ANATOMY:**

**Implications for practice:**

A thorough understanding of anatomical structures and their variations is essential for the success of our patients' treatments in this era of high-quality healthcare and the ongoing pursuit of medical perfection. Teaching medical students and residents about clinically relevant variants will be encouraged by using the EBA approach, especially in surgical specialties and diagnostic/interventional imaging. Additionally, numerous variances are linked to elements like age, sex, and particularly ancestry. Thus, for doctors globally, the capacity to assess the incidence of a variant in various population groups will be of great importance. However, any compilation of anatomical variants will gain from EBA since it will include both overall and subgroup prevalence statistics in addition to descriptive information.

**IMPLICATIONS FOR RESEARCH:**

Reiterating that high-quality SRs rely on the availability of high-quality prevalence studies is necessary. Prior to undertaking a prospective study, writing protocols lowers the possibility of missing essential data and their potential for later analysis.

Researchers will have access to more precise prevalence data for comparison in upcoming epidemiological studies thanks to MA. The general and subgroup pooled results can support or contradict prior frequencies or associations, and such findings are also anticipated to be widely cited in reference textbooks. In example, despite the fact that some ratings in papers and books are based only on professional opinions, they are regularly repeated. Additionally, evidence synthesis might help in assessing etiological theories such genetic, functional, or environmental ones.

**THE FUTURE SCOPE OF EVIDENCE BASED ANATOMY:**

Almost every branch of anatomy, including the gross, microscopic, surface, surgical, and developmental, might be included in the scope of the EBA. Osteo-archeology can also benefit from the application of EBA; for example, the SR on the prevalence of os acromiale included skeletal research and produced a skeletal prevalence in addition to the radiographic and cadaveric results. Additionally, there will be new chances for anatomists to participate in cross-disciplinary studies in a variety of fields, including pathology, kinesiology, biomechanics, functional anatomy, physical anthropology, biological anthropology, and biodistance. Additionally, more opportunities for collaboration between anatomists and clinicians are anticipated.

To sum up, I expect that EBA will revitalize research interest in the field of anatomy by pumping new blood into this fundamental science through the performance of systematic reviews and will create a network for transdisciplinary research by first obtaining acceptance among anatomists and clinicians. In the near future, I'm hoping that anatomical journals will set up an evidence-based review section to aid in promoting the growth of EBA. It is reasonable to say that MA of prevalence studies will represent a significant advancement in epidemiological anatomy research. The best way to accomplish this would be through collaboration between anatomists/clinicians from various backgrounds.

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