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Viewpoint Commentary

NOMENs Land: The Place of Eponyms in the Anatomy Classroom

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INTRODUCTION

The law of Non-Original Malappropriate Eponymous Nomenclature (NOMEN) states that no phenomenon is named after its discoverer (Stigler, 1980; Aresti and Ramachandran, 2012; Aronson, 2014). However, eponymous terms are rife in the anatomical and medical literature. Here the authors support the argument that eponymous terms do not have a firm place and should not be used in anatomy education.

A Brief History of Anatomical Eponyms

Anatomical terminology is complex, with the majority of words having Latin or Greek origins. This anatomical lexicon is challenging to learn and is only compounded with the inclusion of eponyms. Many anatomical structures have a descriptive term (e.g., uterine tube) and often an eponymous term for the same structure (e.g., Fallopian tube). The descriptive terms for muscles, vessels, and nerves were composed in the 16th and early 17th centuries (Sakai, 2007). The rise in popularity of eponyms in the anatomical sciences starting in the 17th century appears to be perpetuated by discoveries of various anatomical structures and the publication of anatomical texts in many different languages (Sakai, 2007). By the 18th century, the prestige associated with being commemorated by an anatomical eponym fueled the fire to claim unnamed structures to be immortalized. Therefore, some eponyms were likely to have been heavily influenced by status, politics, or luck (Woywodt and Matteson, 2007). By the 19th century, 5,000 anatomical structures had a combined 50,000 eponymous and synonymous names (O'Rahilly, 1989). More recently, studies have outlined the number of eponymous terms in the anatomical lexicon; for example, one study identified 44 eponyms that refer to fascial structures alone (Adstrum, 2015), as well as eponyms describing many diseases (Scully et al., 2009a, b). In addition to the sheer volume of eponyms in the anatomical sciences, there are also many variations in spelling and pronunciations of eponyms based on the language utilized, and examples of single eponyms referring to multiple structures, resulting in even more confusion. This can ultimately lead to medical errors (Boonstra et al., 2014; Bahsi and Kervancioglu, 2017; Strzelec et al., 2017; Kucharz, 2020), such as incorrect diagnosis and subsequent treatment due to confusion in

eponymous terms such as Langerhans cells (antigen-presenting dendritic cells) and Langhans cells (a characteristic of granulomas of tuberculosis) (Pritchard et al., 2003). Structures with multiple eponyms (e.g., Poupart's ligament and Fallopiian ligament) and eponyms applied to multiple structures (e.g., Fallopiian tube, Fallopiian canal, Fallopiian ligament) easily result in confusion. Including eponyms in the anatomical lexicon only creates unnecessary confusion for students and clinicians alike.

A solution to the excess of multiple synonymous terms for anatomical structures was the organization and publication of terminology lists. The first international human terminology list, *Basel Nomina Anatomica* (BNA), was written in 1895 (His, 1985; O'Rahilly, 1989). That list proceeded through various iterations until the most recent version, *Terminologia Anatomica*, was published in 1998 via a group effort of anatomists from the Federative Committee on Anatomical Terminology, sponsored by the International Federation of Associations of Anatomists (FCAT, 1989; Whitmore, 1999). Similarly, veterinary anatomy has generated terminology lists by the International Committee on Veterinary Gross Anatomical Nomenclature, sponsored by the World Association of Veterinary Anatomists; the 6th edition of the *Nomina Anatomica Veterinaria* was published in 2017 (ICVGAN, 2017). These terminology lists have significantly reduced the number of synonymous terms and have provided a coherent, internationally accepted system for naming anatomical structures without the use of eponyms.

Despite multiple published terminology lists, they are not used in a consistent fashion (Martin et al., 2009, 2010) and eponyms are still deeply entrenched in the anatomical sciences (Duque Parra et al., 2020). However, many have questioned their use and benefits in anatomy and medical education. Eponyms are not as entrenched in other scientific fields (e.g., mathematics, physics). For example, in astronomy, the International Astronomical Union, founded in 1919, is tasked with naming astrological discoveries and does not utilize eponyms in its naming systems. Instead, other considerations are made when generating names for such discoveries (e.g., coordinates, function, etc.). Similarly, dating back to the

16th century, biology has traditionally named newly discovered organisms based on species names, not eponymously (Marakeby et al., 2014). The *Terminologia Anatomica* specifically excludes eponyms, as they were determined to “give absolutely no anatomical information about the named structure, and vary considerably between countries and cultures.” (Whitmore, 1999). The *Nomina Anatomica Veterinaria* similarly excludes eponyms (ICVGAN, 2017); however, for various reasons, eponyms are not as widespread and entrenched in veterinary medicine as human medicine. Many have argued against the use of eponyms in medical education and practice (Greathouse et al., 2004; Duque-Parra et al., 2006), dating back to the 1950s (Kaplan, 1958). This debate was highlighted in a series of publications in 2014 that debated their use in anatomical literature (Gest, 2014; Fargen and Hoh, 2014; Olry, 2014a, b). While fields such as neurology are starting to see a shift away from eponyms (Becker et al., 2021), little progress to remove eponyms from anatomical education was made following the publication of the first *Terminologia Anatomica* 22 years ago and debate in 2014. A group of researchers have been actively working to “de-eponymize” the anatomical field by creating a searchable database to find the corresponding descriptive term for an eponymous term (Buttner et al., 2020), which provides a foundational step. However, given the lack of substantial movement to remove eponyms from anatomy curricula, in this commentary, we aim to revive this debate in the context of current shifts in culture and outline arguments for expunging them from the anatomical literature.

Eponyms Impact Student Learning

The sheer volume of information in anatomy courses presents challenges for learners. Courses in health science education carry a high cognitive load (Ghanbari et al., 2020). Decreasing this cognitive load can be difficult to accomplish without compromising the content of a course (Qiao et al., 2014). Students learning anatomy for the first time have numerous terms to define, conceptualize, and commit to memory. Learning both the eponym and the descriptive term for a structure increases the already significant cognitive load placed upon students in anatomy.

Additionally, multiple structures have been attributed to the same person [e.g., Fallopian ligament (inguinal ligament), Fallopian tube (uterine tube), and Fallopian canal (facial nerve canal)]. Using identical eponyms for structures in different regions of the body creates confusion for students as the shared name infers a relationship between the structures that may not exist. Therefore, educators can work to reduce the cognitive load on learners and mitigate risk of future legal action by removing eponyms from curricula, which will streamline the list of terminology students are expected to retain.

Beyond discrepancies in eponymous spellings and attributions to multiple structures, descriptive anatomical terms are considered “self-intelligible”, while eponyms must be contextualized (Sakai, 2007). Eponyms provide no information about the morphology, location, or function on their own but descriptive anatomical terms contain some or all of these elements inherently (Greathouse et al., 2004). Therefore, this inherent clarity of descriptive anatomical terms makes them easier to learn and retain (Sakai, 2007).

Furthermore, many anatomical terms are neoclassical compounds, words created from smaller elements called combining forms (McCray, 1998). Each element has its own meaning and can be combined to create a new meaning. Eponyms do not lend themselves to morphological analysis, the breakdown of words into their combining forms, like descriptive terms (Namer and Zweigenbaum, 2004). Descriptive anatomical terms allow students to use prior knowledge of combining forms acquired throughout their anatomy education to recall terms from memory and infer meaning from new terminology. This approach creates “rules” for reading anatomical terms. For example, the combining form hepato- can be combined with -gastric to form hepatogastric; referring to the liver and stomach as in the hepatogastric ligament. Students can use these “rules” as a strategy for learning new descriptive terms, but they cannot be applied to eponymous terms. In this way, descriptive terms are clear, unambiguous, and more meaningful. This system was not unintentional, as one study points out, “In the face of diverse terminology in numerous anatomical books, anatomists in the late 19th century became aware that anatomical terms should be logically consistent, intelligible by themselves, clear in meaning and compact in

form. Otherwise, the diverse terminology would be difficult to teach and cumbersome to use in research” (Sakai, 2007).

Anatomy education aims to develop medical vocabulary for use in diagnosis and communication as a physician (Ferm and Lyons, 1971). While eponyms have long been included in medical vocabularies, they are an unnecessary burden on students and can lead to errors in identifying structures. Eponymous terms do not add value to the anatomical lexicon and detract from it in many ways. In order to move forward, a period of transition may occur in which eponyms are included for historical context to link older and younger generations. Suggestions have been made to include the eponymous term in parenthesis after the descriptive term in educational settings (Greathouse et al., 2004). Over time these outdated and unnecessary terms can be phased out entirely. Discussion has been ongoing about this transition, but if not now, then when?

Eponyms are “Pale, Male and Stale”

Almost 20 years ago, eponyms were spotlighted for having “long been male-dominated and paternalistic” and “inherently elitist” (Alia, 2002). The reader would have heard versions of their names for parts of their body like the *Eustachian tube* for the pharyngotympanic tube, or the *Circle of Willis* for the cerebral arterial circle, even before they attended University. Were these privileged European men the first to observe these (and other) structures and describe them? Buttner and colleagues demonstrated that most non-pathological anatomical eponymous terms were attributed to men from Germany, France and Italy (Buttner et al., 2020); however, several papers have reviewed the history of anatomy and have acknowledged non-European scholars’ contributions to the field (Wiltse and Pait, 1998; Shoja and Tubbs, 2007; Ghosh, 2015; Standring, 2016; Habbal, 2017).

Many macroscopic structures were named in the 16th and 17th centuries before mass publishing and distribution across borders. Indeed, many historical textbooks of anatomy from scholars outside of Europe (Persia, Asia) are now being made public over the internet

(NIH, 2016). Perhaps these scholars were the first to identify gross anatomical structures? Microscopic features were named in the early 19th century after the invention of the microscope. Sadly, however, women were still not allowed into the anatomy laboratory until the late 19th century at the earliest (Kelly, 2010), and those without the financial means to attend institutions of education were also excluded. There were no prizes for coming second; those who published their observations and distributed it widely claimed the fame and gave structures their name.

Some men are known to have had an eponym wrongly attributed to them. Boonstra et al. note that after reading German anatomist Hubert von Luschka's (1820-1875) original textbook, they did not find any descriptions of ducts/ductules traversing the gallbladder fossa, which have carried his moniker for over a century (Boonstra et al., 2014; Burdan et al., 2016). Stern (1986) reviewed the literature and found that observations of the hepatopancreatic ampulla, named the ampulla of Vater after German anatomist Abraham Vater (1684-1751), had been published during the 17th century by at least seven anatomists before Vater. English anatomist Samuel Collins (1618-1710) published a clear description of the hepatopancreatic ampulla in 1658, some 35 years before Vater (Stern, 1986). The inguinal ligament, once known as Poupart's ligament after French anatomist Francois Poupart (1661-1708), was "first" described over a century earlier by Italian anatomist Gabrielle Falloppio (1523-1563) (Ellis, 2006). However, Falloppio was awarded the eponymous term for the uterine tubes, although he was not the "first" to discover them (Herophilos (335-280 BC) and Galen (129-216) noted them much earlier) and he did not ascertain their true function [discovered in 1672 by Reinier de Graaf (1641-1673)]. These erroneous eponyms have persisted for hundreds of years.

More troubling is the rapid spread of "fake news" into peer-reviewed manuscripts and textbooks. In 2017, a video was uploaded to YouTube and humorously referred to the median umbilical ligament as the "Xander ligament" (Ledger and Toftness, 2020). This video, viewed over 120,000 times, resulted in a prankster editing the Wikipedia page for

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median umbilical ligament and shortly after the “Xander ligament” appeared for the first time in print in the *Mayo Clinic Proceedings* journal (Giridhar and Kohli, 2017). Subsequently, it has appeared in the 2019 edition of the Dutch *Textbook of Obstetrics and Gynaecology: a Life Course Approach* (Steeegers et al., 2019). More recently, Knipe et al. (2021) discovered the erroneous origin of the eponymous term “Baum’s loop” to describe the dorsal bundle of the optic radiation. The eponym was contrived by a Dr. A. Baum who inserted the term into a Wikipedia article which was then used in several peer-reviewed manuscripts and textbooks, including on page 174 of the first edition of *Gray’s Surgical Anatomy* (Panesar et al., 2020; Knipe et al., 2021). Removing eponyms from anatomy education and textbooks and using the correct anatomical terms mitigates the risk of perpetuating erroneous terms.

Some people do not want structures in their pelvis and perineum labelled with eponymous terms (Kaminsky, 2018). The Fallopian (uterine) tubes, Bartholin (greater vestibular) glands, and the pouch of Douglas (rectouterine pouch) are all named after men. Dr. Leah Kaminsky wrote an article for the BBC in June 2018. There were over 500,000 views on the BBC websites but what was most concerning was the number of vitriolic posts leveled at Dr. Kaminsky (Kaminsky, 2018); the white male fraternity arose in anger. Clearly, the use of eponyms is still a highly contentious issue in public and professional fields.

The use of Nazi eponymous terms is inappropriate and is to be actively discarded. Strous and Edelman (2007) shed light on eponyms of aggressors such as Austrian anatomist Eduard Pernkopf (1888-1955) and his *Atlas of Topographical and Applied Human Anatomy* (Pernkopf and Ferner, 1963-1964); those who supported eugenics such as Swiss-born cardiologist and anatomist Wilhelm His Jr (1863-1934) who had the atrioventricular bundle named after him; and also those of victims such as German pathologist Ludwig Pick (1868-1944) after whom Pick’s cell is named and who died in Theresienstadt concentration camp (Strous and Edelman, 2007; Burdan et al., 2016). In 2010, the naming of the bronchiolar exocrine cell as the “Clara” cell was publicly removed after Winkelmann and Noack’s paper exposed that German anatomist Max Clara (1899-1966) was a Nazi whose research

findings were based on tissue from executed prisoners (Winkelmann and Noack, 2010; Woywodt et al., 2010). Burden et al. (2016) have provided an extensive list of eponyms and their proper anatomical terms to aid anatomists and health professionals in transitioning from eponymous terms to those in the *Terminologia Anatomica*.

Why Should Educators Use Eponyms?

Many have argued for the use of eponyms in medical education. Here, the authors explore two of the most common arguments to use them and their counter-arguments.

Clinicians Use Them Because They Are Easy

Many argue that a compelling reason to continue to teach eponyms is that clinicians commonly use them. However, the body of this viewpoint commentary has already established many reasons why clinicians should not use eponyms. The only way to get clinicians to stop using them is to train *future* clinicians not use them. If that occurs, then at some point in the relatively near future, the current learners will be the clinicians and can popularize the use of anatomical terms over eponymous ones.

It is argued that clinicians use eponyms because they are a convenience and save space and time due to the shortening of words, and allow for clinicians to have a simple way to reference complex medical conditions and syndromes (Kachlik et al., 2008; Ma and Chung, 2012). While that may be true, it has also been found that the use of eponyms as a shorthand leads to clinical errors (Pritchard et al., 2003; Waseem et al., 2005; Strzelec et al., 2017). This is likely in part due to the aforementioned confusion caused by different spellings of eponyms based on languages and multiple structures (and conditions) that have the same eponym attached to them. Ease of use should not supersede patient safety.

Eponyms Remind Us of Anatomy's History

Another reason that proponents of the need to teach eponyms in medical education use is because it helps preserve and deepen the appreciation for the history of medicine

(Whitworth, 2007; Werneck and Batigália, 2011; Bunch, 2016; Bunch and Zamani, 2016; Toodayan, 2017; Van Tassel et al., 2018; Yale et al., 2020; Becker et al., 2021; Benner et al., 2021). They also provide an opportunity to recognize the efforts of scientists before us to advance medical knowledge and that these scientists deserve to have their names immortalized (Habbal, 2017). As outlined above, not all names deserved to be immortalized, whether it was because the discovery was effectively stolen from someone more deserving or through the lens of history that individual was not deemed worthy of our modern-day adoration. In addition, there is outstanding literature that documents the history behind various eponyms used in human medicine (Herbella et al., 2004; Duque-Parra et al., 2006; Conti, 2011; Musil et al., 2011; Werner et al., 2019; Benner et al., 2021; Ellis, 2006); this sheer amount of information cannot be covered in a traditional anatomy course. Therefore, the authors would propose that if an individual or institution wishes to educate learners in the history of medicine and properly recognize the accomplishments of past scientists that separate history of medicine courses should be implemented so that time can be adequately dedicated to disseminating such knowledge.

CONCLUSIONS

Based on the arguments presented above, the teaching of eponyms should no longer be included in anatomy coursework that is focused on teaching anatomical content to future health professionals, and anatomy educators should begin to phase out eponyms from their curricula. Specific methods for how this should be accomplished still need to be determined. The authors hope that further discussions can be had with clinicians, educators, and learners regarding the place of eponyms in the anatomy classroom.

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