

Clinical Relevance of Official Anatomical Terminology: The Significance of Using Synonyms

Relevancia Clínica de la Terminología Anatómica Oficial: La Importancia de Usar Sinónimos

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SUMMARY: *Terminologia Anatomica* is a unique collection of technical terms that enable communication in anatomy and medicine across the world. However, current anatomical terminology also contains some internal inconsistencies and discrepancies in regard to clinical terminology. Thus, a number of terms are not logically related to the names of similar anatomical entities, or the names of corresponding physiological and pathological conditions. Moreover, during clinical practice many anatomical terms have commonly been replaced by new, clinical idioms. These terminological discrepancies represent an impediment to learning and teaching in medical and health professions programs. In this paper it is proposed that the relevant synonyms should be introduced into *Terminologia Anatomica* in the same way as currently the case for the kidney (*ren/nephros*) and uterine tube (*tuba uterina/salpinx*). This change would significantly reduce inconsistencies in nomenclature and make anatomical terminology more logical, easier to understand and memorize. Further more, it would better align anatomy with other branches of medicine and medical education.

KEY WORDS: Anatomical nomenclature; Anatomical terminology; Gross anatomy education; Medical education; Synonyms.

INTRODUCTION

Throughout history, the discipline of anatomy has provided the educational foundation for all medical and health professions, since a sound knowledge of structure and function of the human body is prerequisite for safe and efficient clinical practice. Similarly, anatomical terminology, as complex and difficult as the discipline of anatomy itself, provides the basis for effective communication in all medical fields. A global agreement has been reached on the composition and usage of anatomical nomenclature. *Terminologia Anatomica (TA)* has been the result of a concerted effort by anatomists to produce a nomenclature for their discipline.

From a student's standpoint two things are very important: to understand the meaning of anatomical terms in order to avoid short-term and mechanical memorization, and to provide future understanding of the physiology, pathology and clinical subjects. Gest *et al.* (2009) succinctly articulated the essential attributes of the effective anatomical terminology when they stated that nomenclature has to be "simple, logical and consistent".

Smith *et al.* (2007) also showed that understanding etymology helps in learning anatomy to a large extent. However, some internal inconsistencies in *TA* would seem to impede this comprehension. An example is the names of some homologous structures which stem from different roots (e.g., *diaphragma* and *n. phrenicus*, and *lingua* and *n. hypoglossus*). On the other hand, clinical language has numerous terms not included in the official anatomical terminology, adding yet further and unnecessary difficulty to the learning process. Across many medical universities and faculties, after their preclinical studies, students begin their clinical work facing many new terms for different disorders, diseases, conditions, diagnostic and therapeutic procedures that cannot be brought into relation with previously learned names of corresponding anatomical structures (e.g. *vesica biliaris* and *cholecystitis*, or *palpebra* and *blepharitis*). As Hirsch (2011) noted in this respect: "as soon as our students begin their clinical clerkship, they will shift to the terms used by their clinical instructors, and that will become their permanent language". The reason of that confusion is using terms with roots from

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different languages. On several places *TA* proposes two or more alternative terms to name the same structure but there are still some terms that could be supplemented by corresponding synonyms that will help understanding clinical language.

The aim of this review is to indicate the necessity of usage the synonyms in order to make anatomical language understandable to clinicians and to maintain logical continuity in learning during basic and specialized studies.

Synonyms in the *Terminologia Anatomica*. There are several instances in *TA* where more than one term is listed to denote a single anatomical structure. This arrangement assists in understanding and better connecting relevant anatomic structures. For example, the anatomical terminology contains two names for kidney - *ren* and *nephros*. Thereby, *nephros* is used more often in clinical conditions (e.g. in *glomerulonephritis*, *nephrolithiasis* or *nephrectomia*), whereas the term *ren* is applied to the construction of other anatomical terms denoting structures related to the kidney (e.g. *a. and v. renalis*, *fascia renalis*). Considering the synchronal usage of these terms in anatomy and in the clinic, it would seem appropriate to include both in the official terminology. Similarly, listing the synonym for soft palate - *velum palatinum* next to the preferred *palatum molle* would help in understanding the names of the two muscles of the soft palate - *m. levator veli palatini* and *m. tensor veli palatini*. Names of functional disorders of the hypophysis (*hypopituitarismus*, *hyperpituitarismus*) and names of the glial cells of the posterior lobe of hypophysis (pituicytes) are logically derived from the synonym of the hypophysis - *glandula pituitaria*, which is also reasonably given as the alternative term in *TA*.

Simultaneous usage of the terms orchis (*ορχις*) and testis, as well as *tuba uterina* and *salpinx* (*σαλπιγξ*), is valid from the clinical standpoint; corresponding Greek-derived terms are more often used in clinical designations such as *orchitis*, *anorchia*, or *salpingitis*. Furthermore, the term *salpinx* is the root for the name of another anatomical structure - *mesosalpinx*, which is listed in the official terminology.

Terminologia Anatomica (and also new *Terminologia Neuroanatomica*) gives three options for the lower part of the brainstem: *myelencephalon*, *medulla oblongata* and *bulbus* which makes for easier understanding of other anatomical terms such as *sulcus bulbopontinus* or *tractus bulboreticulospinalis*, as well as clinical terms, e.g. bulbar palsy, corticobulbar tract, or myelography (Federative International Programme on Anatomical Terminologies, 2017).

Another example of the use of alternative terms in *TA* is the synonym for the vertebral articular process - *zygapophysis*, which provides a logical transition to the term *articulatio zygapophysialis*. Both the terms *pudendum femininum* and *vulva* are given in *TA* and, as such, assist in understanding the meaning of corresponding structures such as *n. pudendus* or *canalis pudendalis*, as well as associated clinical terms, e.g. *vulvitis* or *vulvovaginitis*.

Potential new synonyms for the *Terminologia Anatomica*.

In addition to the existing, a number of new synonyms could be introduced in the anatomical terminology to facilitate the understanding of other anatomical and clinical terms. There are numerous examples that highlight the differences between anatomical and clinical terminology when referring to the same structure. Linguistically, the main reason for this inconsistency is the fact that terms have their roots from words belonging to different languages. It appears that this occurs most commonly in ophthalmology, a medical specialty which utilizes mainly Greek-derived terms: the term ophthalmology itself derives from the Greek term *ophthalmos* (*οφθαλμος*), rather than the Latin *oculus*; the clinical terms relating to the eyelids, e.g. *blepharitis* (*βλεφαρίτις*) and *blepharoplastica* (*βλεφαροπλαστική*) are derived from the word *blepharon* (*βλεφαρον*), instead of the official anatomical term *palpebra*; inflammation of the lacrimal gland - *dacriocystitis* (*δακρυοκυστίτις*) and cornea - *keratitis* (*κερατίτις*) originate from the Greek words - *dacriocystis* (*δακρυοκίστις*) for lacrimal gland, and *keras* (*κερας*, *κερατο*) - horn (*cornea* - *κερατοειδής/keratoeides*), rather than from *glandula lacrimalis* and cornea, respectively; the synonym for the vascular tunic of the eye (*tunica vasculosa*) - *uvea*, which is unknown to official anatomical terminology, is used in the term which refers to the inflammation of *iris*, ciliary body (*corpus ciliare*) and choroid (*choroidea*) - uveitis. Previous versions of anatomical terminology (International Anatomical Nomenclature Committee, 1989) contained the term *tractus uvealis*, which seems more appropriate within the clinical setting. Inflammation of the iris and ciliary body - *iridocyclitis* also contains a Greek term for *corpus ciliare* - *kyklos* (*κύκλος*; circle) (Stamatakos, 1972; Stedman, 2005). Terms phacotomy, *aphakia* or *phacocystitis* are also derived from the Greek word *phacos* (*φακός*) instead from Latin *lens*. Canthus (*kanthos*, *κάνθος*) is yet another a Greek term for the angle of the eye (*angulus oculi* or *commissura palpebrarum* in *TA*) that is clinically recognizable in terms like *epicanthus* and *telecanthus*.

Other medical specialties similarly feature terminological inconsistencies: the name otorhinolaryngology contains two terms that are unknown to the official terminology - *otos* and *rhinos*. The terms

rhinitis and *rhinoplastica* are derived from the Greek term for nose - *rhinos* (ρίζ *gen. ρινόζ*), and not from the Latin *nasus*. Additionally, term *rhinos* is recognizable in the neuroanatomical terms referring to the position of olfactory structures - entorhinal area or rhinal sulcus. Instead of *auris*, the word *ous* (ουζ, ουζ, *gen. ωτόζ*) is used in the construction of the names *otitis*, *otorrhea*, *otorrhagia*, or *otalgia*. The official anatomical term *glandula parotidea* is logically constructed according to the gland's positional relationship with the auricle of the ear. Terms *myringitis* and *myringoplastica* don't associate on the name of the involved structure - eardrum (*membrana tympanica*) because they are derived from the term *myringa* (Stamatagos; Mosby's Medical Dictionary, 2013).

On a broader level, the chapter on *General Terms* in the *TA* should contain the synonym for cartilage - *chondros* (χόνδρος), which would facilitate the understanding of names of other anatomical structures such as *artt. interchondrales*, *artt. costochondrales*, *regio hypochondriaca*, and also several clinical conditions, e.g. *achondroplasia*, *chondromalacia* and *chondrocyte* (Panourias *et al.*, 2011). The same chapter should also include terms such as *viscera* or *splanchna* (σπλάγγνα) that explain names like *pleura visceralis*, *peritoneum viscerale*, or *nn. splanchnici*.

The idiom *spondylos* (σπόνδυλος) is more often used in clinical practice than the official anatomical term *vertebra* in terms such as *spondylosis* or *spondyloarthritis* (Panourias *et al.*, 2011). The alternative term for *columna vertebralis* - *spina dorsa* - has its basis in *medulla spinalis* ("core of the spine"), *nn. spinales*, *dura mater spinalis* or spinal anesthesia. Panourias *et al.* (2011), also point to the alternative name *notaios myelos* (νωτιαίος μυελός) which is used in the terms *notochorda*, *notalgia*, *myelomeningocela*. The root *myelos* (μυελός) is contained in the term *myelencephalon*, which is given in *TA* with names *medulla oblongata* and *bulbus*. *Hieron osteon* (ἱερόν ὄστέον) is the old Greek term for *sacrum* ("sacred" or "holy" bone) and is used in terms describing the shape of sacrum - *dolichohieric* or *platyhieric*.

The word *pneumonia* (πνευμονία) has its root in the Greek name for the lungs - *pneumon* (πνυμων), while *TA* only contains the term *pulmo*. If the synonym *phren* would be listed next to the official term *diaphragm* students would easily understand terms such as *n. phrenicus*, *recessus phrenicomediastinalis*, *a. phrenica superior*, etc. Since the term *phren-* (φρην, φρεν) has wider connotations - also meaning soul, heart, spirit, or mind - it, in combination with the term *skhizein* (σχίζειν, dividing), forms the well-known clinical term *schizophrenia*.

The clinical terms *mastitis* and *mastectomy* are derived from the term *mastos* (μαστός, breast) instead of the term *mamma*. Similarly, the term *thele* (θηλη), as the synonym for nipple (*papilla mammaria*), is present in the names of developmental disorders, e.g. *athelia* and *polythelia*, as well as in terms denoting inflammation (*theilitis*) and plastic surgery of the nipple (*theleplastica*).

For a student who is only familiar with the term *pelvis renalis*, the term *pyelonephritis* fails to fully explicate the inflamed structure. This is because the synonym *pyelon* or *pyelos* (πυελος) is not recognized in the official terminology and most anatomy textbooks. Some clinicians also still use old term for the posterior segmental artery of the kidney (*a. segmenti posterioris*), based on the term *pyelos* - *a. retropyelica*.

Instead of two formal anatomical terms - *vesica biliaris* and *vesica fellea*, names of disorders, like *cholecystitis* and *cholelithiasis*, or surgical procedures such as *cholecystectomy*, that involve the gallbladder, contain a third term for the gallbladder - *cholecystis* or *choledochocystis* (χοληδόχος κυστίς). Terms denoting bile: *chole* (χολη), *bilis* and *fel* are used in parallel to derive the names of related anatomical structures: *ductus choledochus*, *ampulla biliaropancreatica*; *vesica biliaris*, *vesica fellea*, while *cholecystis* contains a part of the phrase denoting the duct of the gallbladder - *ductus cysticus*. Similarly, the term denoting inflammation of the urinary bladder (*cystitis*) does not reflect the official anatomical term - *vesica urinaria*; the terms *cystis* or *kystis* (κυστίς), *cystectomy* or *cystoscopy* being instead preferred in clinical settings.

Terminologia Anatomica should include the alternative term for *cor* - *cardia* (καρδία), since it provides the basis for the terms *epicardium*, *myocardium* and *endocardium*, and is often used within the clinical setting, e.g. in cardiology and cardiac arrest. Clinical terms *phlebotomy* and *phlebitis* are derived from the Greek synonym for vein - *phleps/phlebos* (φλεψ/φλεβός).

Rare anatomical terms are often used in the names of gastrointestinal disorders. The terms *sialoadenitis* and *sialolithiasis* contain the Greek word for saliva - *sialon* (σίαλον), instead of Latin term - *saliva* (which was used in the term *glandulae salivariae*). The term for inflammation of the lips (*cheilitis*) omits the official anatomical term *labium*, but uses rather the Greek *cheilos* (χειλος). Similarly, the term for inflammation affecting mucous membrane of the mouth (*stomatitis*) is derived from *stoma* (στόμα), which could be considered as the proper synonym for the term *os*. In this way, the term

stomatology also becomes self-explanatory. Instead of *lingua*, the term *glossa* (γλωσσ) is the basis of the names of disorders affecting the tongue (e.g. *glossitis*, *macroglossia*, *aglossia*) and its associated anatomical structures (e.g. *n. glossopharyngeus*, *n. hypoglossus*, *plica glossoepiglottica*).

Gaster and *ventriculus* should both be used for the stomach, as the case in previous editions of anatomical terminology (International Anatomical Nomenclature Committee, 1966, 1989). This is because both terms are utilized in clinical conditions – e.g. *gastritis*, and *ulcus ventriculi*. The term *enteron* (εντερον) is used in the name denoting inflammation of the small intestine – *enteritis*, instead of the anatomical term *intestinum tenue*; the same term is found in the word gastroenterology. The synonym *proctos*, for anal canal, is present in the clinical term *proctitis* and the name of that whole branch of medicine - proctology. Greek term for *caecum* – *typhlon enteron* is kept in the term *typhlitis*. Terms *omphalocoele*, *omphalitis*, and also *ductus omphaloentericus* originate from the term *omphalos* (ὀμφαλόος) for *umbilicus*.

In endocrinology, the term *glandula adrenalis* is used for *glandula suprarenalis*, e.g. in *adrenalectomia*, *hyper- or hypoadrenocorticismus*, as well as *adrenalin*. Furthermore, term *aden* (αδην gen. αδενος) is used more often clinically than *glandula*, e.g. in the name denoting inflammation of the sweat glands (*hydradenitis*), inflammation of the lymph nodes (*lymphadenitis*), in the term denoting the pharyngeal tonsil – *adenoids* (αδενοειδης) and its surgical removal – *adenoidectomy* (Panourias *et al.*, 2012). It should be mentioned that the clinical terms for lymph nodes and tonsils kept with the old view that these are glands; this, however, was subsequently corrected in *TA* (Panourias *et al.*, 2011).

The term *oophoron* (ωοφόρον) should be added to the preferred *ovarium*, as the case in the examples *testis/orchis* (ὄρχεις) and *tuba uterina/salpinx* (σαλπινξ). For clinical purposes, the term *oophoron* exists in names like *oophoritis* and *oophoralgia*. The terms *uterus*, *hystera* (υστερα) and *metra* (μητρα) are used concurrently in the names of different conditions, procedures and medications (e.g. *metrorrhagia*, *hysterectomy* and *uterotonics*). The term *metra* is also contained in other anatomical terms related to the uterus: *endometrium*, *myometrium*, *perimetrium*. Commonly, ovary and uterine tube are clinically unified by the term *adnexa uteri* and used in terms like *adnexitis* and *adnexectomy*, while being foreign to anatomical terminology. Gynecologists often use the alternative for *vagina* – *colpos* (κόλπος), in for example *colpitis* (used in parallel with *vaginitis*) or *colposcopy*;

it would therefore appear fully justifiable to include both terms in *TA*. Moreover, *colpos* may be the more appropriate term as *vagina* is also used in the anatomical description of tendon sheaths (*vagina*, *ae* - sword-sheath). Without knowledge of the synonym for *ductus deferens* – *vas deferens*, (included only as the English variant in *Terminologia Anatomica*), the term *vasectomy* (*vasectomy*) fails, at first sight, to indicate the organ being removed. In similar vein, the clinical terms for penile inflammations - *balanitis*, *posthitis* and *balanoposthitis*, and *postectomy* - are derived from the Greek terms for *glans penis* – *balanos* (βαλανος) and *preputium* – *acroposthe* (ακροποσθη) (Stamatatos).

According to the new anatomical terminology term *fibularis* is preferred being consistent with the official anatomical term for “adjacent bone” (*fibula*), but the other name *peroneus* is kept in the names of corresponding anatomical structures (*n. peroneus communis*, *m. peroneus longus*, *m. peroneus brevis*; *m. peroneus tertius*). Clinical terminology recognizes the term *peroneal palsy* is still used; *perone* (περόνη) representing the older, Greek-derived synonym for *fibula*. The name *m. omohyoideus* is derived from *scapula*’s synonym – *omoplata* (ὀμοπλατα), assigning the bone that gives the attachment of the muscle (Sprumont, 2016). Terms *gnathos* (γναθος) and *genys* (γενυς) for mandible explain terms like *gnathology* and *m. genyohyoideus*, respectively, while the term *ankon* (αγκων) for cubitus explains the term *m. anconeus* (Schulze & Donalies, 2008).

The anatomical term *cutis* is not reflective of the branch of medicine that deals with the skin – dermatology, as this uses the root *derma* (δερμα). Moreover, *derma* is found in other anatomical terms, such as *dermis* and *epidermis*. Similarly, diseases and conditions such as *paronychia* or *onychomycosis* omit the anatomical term *unguis* but use instead the alternative *onyx* (όνυξ, ὄνυχος). *Dactylos* (δακτυλος) is also a forgotten anatomical term denoting finger but can be recognized in clinical terms like *polydactyly*, *macroductyly*, *dactylectomy*, etc.

The terms suggested in this paper for inclusion in *TA* eventually (usually at the latter stages of medical education), in one form or another, enter the medical clinical parlance and are adopted by practitioners. It therefore would seem fully justifiable to incorporate them into the official anatomical terminology and to learn them while studying anatomy. This will undoubtedly provide more logic to the learning process and facilitate greater integration with the clinical subjects.

DISCUSSION

One of the key components of learning anatomy is mastery of its language. While representing a considerable challenge, this learning is highly rewarding as it enables students not only to understand the content of anatomy, but also that of other pre-clinical and clinical subjects. The aim of this paper is not to criticize official *TA* but to contribute to this dynamic discourse on terminology and argue that relatively minor changes in *TA* and/or anatomy textbooks, consisting of the introduction of a number of additional synonyms, could significantly improve the current nomenclature. These changes would be particularly beneficial for students both for the learning of anatomical and medical terminology as well as the integration and alignment of anatomy with the clinical disciplines. Using synonyms may involve some initial increase in learning difficulty and communication (Gobée *et al.*, 2011), but from the broader perspective embodies a more logical approach and therefore the potential to make the studying process ultimately easier and more effective (Smith *et al.*). Two problems are to be discussed: inconsistencies in the Terminologia itself and inconsistencies between anatomical and clinical terminology.

Like any other language, whether technical or ordinary, the language of anatomy has been continuously evolving, adapting to the constantly shifting landscapes of science and medicine and the needs of their practitioners (Sprumont). This transformation was for a lengthy period of time carried out in a rather haphazard manner, producing diverse usages and terminological confusion. It has been estimated, for instance, that by the end of the nineteenth century anatomists used around 50,000 terms to designate some 5,000 anatomical structures (O'Rahilly, 1989). As medicine, science and society in general, were becoming more "globalized" a need to form universal anatomical terminology and the rules of its application strongly emerged resulting in the production of the nomenclature for the usage across the national boundaries and the confines of different teaching and research traditions. The first step in this process was creation, by a group of renowned German-speaking anatomists, of the compendium of anatomical terms – Basle Nomina Anatomica (Kachlik *et al.*, 2008). Published in 1895, Nomina were not immediately accepted globally. However, in subsequent years through a complex process of discussions and negotiations, a global agreement has been reached on the use of anatomical nomenclature embodied in the latest edition of the *TA* - a formidable publication containing more than 7,500 terms, produced under the auspices of the International Federation of Association of Anatomists

(Federative International Programme on Anatomical Terminologies, 2011). It comprises Latin anatomical terms (and their English equivalents) originating mainly from the Ancient Greek and Latin, although some terms have their roots in the Sanskrit, Classical Arabic and Ancient Egyptian languages (Polackova, 2001; Wulff, 2004; Sprumont). However, there are many discussions about the content of *TA* and the validity of using suggested anatomical terms. As noted by several authors, *TA* still contains some mistakes (Krmptotic-Nemanic & Vinter, 2003; Kachlik *et al.*, 2009), it is not consistently implemented by anatomists (Vogl, 2009; Martin *et al.*, 2014) and can still be improved and made more user friendly (Bard, 2005; Fabry *et al.*, 2005; Gest *et al.*), through inclusion of the more recently occurring changes in terminology and rules of nomenclature (Rosse, 2001; Pawlina & Drake, 2009; Strzelec *et al.*, 2017). There are also internal inconsistencies in *TA* - different roots are using for naming the homologous structures (i.e. *diaphragma* and *n. phrenicus*). From the student's point of view it is very important to properly understand the meaning of anatomical terms in order to avoid short-term and mechanical memorization.

The most logical solution would be the introduction of synonyms as was done for *tuba uterina*, *processus articularis (superior/inferior) vertebrae* or *palatum molle* explaining other anatomical terms derived from their synonyms: *mesosalpinx*, *art. zygapophysialis* and *m. levator veli palatini*, respectively. Using synonyms may be confusing and problematic in professional communication, like it was suggested by Gobée *et al.*, but it makes studying process easier and effective (Smith *et al.*).

The inconsistencies of the current anatomical nomenclature with clinical terminology is seen as a further, even greater, problem and impeding medical education (Hirsh *et al.*, 2011; Strzelec *et al.*). To a considerable degree this is the result of the inconsistencies in clinical terminology as well as the failure of clinicians to use proper terminology (Kachlik *et al.*, 2008, 2009; Strzelec *et al.*). As Moerkerke & Ceusters (2000) pointed out it sometimes appears that each clinician has his or her own preferred term. However, although anatomists should not simply dictate to clinicians on how to use the terminology they should perhaps take a more proactive role in connecting it with clinical practice (Martin *et al.*). Some synonyms in *TA* help to a large extent understanding relevant clinical conditions (i.e. terms *testis* and *hypophysis* correlate with the names of corresponding anatomical structures - *a. testicularis* and *fossa hypophysialis*, respectively, but their synonyms *orchis* and *glandula pituitaria* better correlate

with the names of corresponding pathological conditions - *orchitis* and *hypopituitarismus*, respectively) but some more adjustments in anatomical nomenclature might help narrow the language rift between “the laboratory” and “the clinic”. Comparing to previous editions *TA* (Federative Committee on Anatomical Terminology, 1998) improved some terms and made them more familiar with clinical language (i.e. *lien* and *ren* have alternative names - *splen* and *nephros*, respectively), but some are diminished (i.e. *tractus uvealis*). One such relatively small but potentially profitable change would consist in keeping some of the existing terms with the addition of new synonyms like *blepharon*, *pneumon*, *mastos* or *proctos*. This would not only improve the adoption of other-derived anatomical terms, but also improve their congruency with clinical terminology.

However, while these postulated features, with which undoubtedly most anatomists would agree, appear theoretically sound, in practice they might not be easy to apply. This is particularly the case when they conflict with each other, making terminological solutions more of a set of trade-offs rather than ideal solutions. In a number of cases it might be advantageous to forgo simplicity (i.e. one term for one structure) and introduce synonyms to increase the consistency of nomenclature – both for internal consistency and consistency in relation to other branches of medicine.

This review surely couldn't cover all potential problems in understanding anatomical terminology as well as differences between anatomical and clinical language which gives opportunity for further discussions. Analysis of the origin of rare anatomical terms that are in the clinical use could explain above discussed discrepancies. The history of using those terms is intriguing as well as potential reasons for splitting anatomical and clinical terminology. Sprumont gave an historical overview on the origin of the anatomical terms noticing that “Pathology and Therapy were significantly less Latinized than Anatomy”. One of problems while suggesting the potential synonyms for the *TA* arise from the fact that not all Greek terms have their proper Latin transcription and some survived only in a form of prefixes (e.g. hyper instead of super) (Wulff). Such example is the synonym for the term cornea – term that designates inflammation of cornea (*keratitis*) originates from the term *keras* that means horn (lat. *cornu*) but there is no proper Latin transcription for the cornea itself. Such is the case of term *kyklos* (lat. *cyclos*) that is sometimes translated as the ciliary body (Stedman) but actually means “circle” denoting only an association with the ciliary body. Some terms, thus, have to be newly coined.

CONCLUSIONS

Through the discipline of anatomy and its official nomenclature embodied in *TA*, students also acquire the universal language of medicine. *Terminologia Anatomica*, however, includes a number of internal and external inconsistencies, which could be easily circumvented by the introduction of relevant synonyms for currently listed terms. Inclusion of these new terms could also be viewed as a transitional stage, since in the future some of the synonyms (those inconsistent with other anatomical and clinical terms) can be eliminated. While the changes suggested here would at first introduce some additional effort on the part of both students and anatomists, this could be a worthwhile trade-off as it would enable better understanding of anatomical and clinical terms and foster deep learning instead of short term, mechanical memorization. Standardization and alignment of anatomical and clinical terms are undoubtedly complex processes. The terminological changes suggested here will not solve all the problems relating to the complexity of anatomical and medical nomenclature, but might be a step in pointing anatomy, medicine and medical education in the right direction, i.e. towards improved comprehension of medical concepts among medical students and better communication between practitioners.

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RESUMEN: *Terminologia Anatomica* es una colección única de términos técnicos que permiten la comunicación en anatomía y medicina en todo el mundo. Sin embargo, la terminología anatómica actual también contiene algunas inconsistencias internas y discrepancias con respecto a la terminología clínica. Por lo tanto, varios términos no están lógicamente relacionados con los nombres de entidades anatómicas similares, o los nombres de las correspondientes condiciones fisiológicas y patológicas. Además, durante la práctica clínica muchos términos anatómicos han sido comúnmente reemplazados por nuevos modismos clínicos. Estas discrepancias terminológicas representan un impedimento para el aprendizaje y la enseñanza en los programas médicos y profesionales de la salud. En este trabajo se propone que los sinónimos relevantes se introduzcan en la terminología anatómica de la misma manera que en la actualidad, como en el caso del riñón (*ren* / *nephros*) y la tuba uterina (*tuba uterina* / *salpinx*). Este cambio reduciría significativamente las inconsistencias en la nomenclatura y haría la terminología anatómica más lógica, más fácil de entender y memorizar. Además, alinearía mejor la anatomía con otras áreas de la medicina y la educación médica.

PALABRAS CLAVE: Nomenclatura anatómica; *Terminologia Anatomica*; Educación en anatomía; Educación médica; Sinónimos.

REFERENCES

- Bard, J. B. *Anatomics: the intersection of anatomy and bioinformatics. J. Anat.*, 206(1):1-16, 2005.
- Fabry, P.; Baud, R. & Lovis, C. Towards a multilingual version of *Terminologia Anatomica. Stud. Health Technol. Inform.*, 116:665-70, 2005.
- Federative Committee on Anatomical Terminology (FCAT). *Terminologia Anatomica. International Anatomical Terminology*. Stuttgart, Thieme, 1998. pp.292.
- Federative International Programme on Anatomical Terminologies (FIPAT). *Terminologia Anatomica. International Anatomical Terminology*. 2nd ed. Stuttgart, Thieme, 2011. pp.292.
- Federative International Programme on Anatomical Terminologies (FIPAT). *Terminologia Neuroanatomica*. FIPAT.library.dal.ca. Federative International Programme for Anatomical Terminology, 2017.
- Gest, T. R.; Burkel, W. E. & Cortright, G. W. A need for logical and consistent anatomical nomenclature for cutaneous nerves of the limbs. *Anat. Sci. Educ.*, 2(3):126-34, 2009.
- Gobéc, O. P.; Jansma, D. & DeRuiter, M. C. AnatomicalTerms.info: heading for an online solution to the anatomical synonym problem hurdles in data-reuse from the *Terminologia Anatomica* and the foundational model of anatomy and potentials for future development. *Clin. Anat.*, 24(7):817-30, 2011.
- Hirsch, B. E. Does the *Terminologia Anatomica* really matter? *Clin. Anat.*, 24(4):503-4, 2011.
- International Anatomical Nomenclature Committee (IANC). *Nomina Anatomica*. 3rd ed. Amsterdam, Excerpta Medica Foundation, 1966. pp.112.
- International Anatomical Nomenclature Committee (IANC). *Nomina Anatomica*. 6th ed. Edinburgh, Churchill Livingstone, 1989. pp.E52.
- Kachlik, D.; Baca, V.; Bozdechova, I.; Cech, P. & Musil, V. Anatomical terminology and nomenclature: past, present and highlights. *Surg. Radiol. Anat.*, 30(6):459-66, 2008.
- Kachlik, D.; Bozdechova, I.; Cech, P.; Musil, V. & Baca, V. Mistakes in the usage of anatomical terminology in clinical practice. *Biomed. Pap. Med. Fac. Univ. Palacky Olomouc Czech Repub.*, 153(2):157-62, 2009.
- Krmpotic-Nemanic, J. & Vinter, I. Incorrect medical terms in *Terminologia Anatomica* (1998). *Ann. Anat.*, 185(2):195-6, 2003.
- Martin, B. D.; Thorpe, D.; DeLuna, V.; Howard, T.; Hagemeyer, J. & Wilkins, N. Frequency in usage of *Terminologia Anatomica* terms by clinical anatomists. *J. Biomed. Educ.*, 2014:950898, 2014.
- Moerkerke, C. & Ceusters, W. The Myth of Preferred Terms In Medical Sublanguage And Its Impact on Natural Language Understanding Applications: An Empirical Study. In: De Moor, G. & De Clercq, E. (Eds.). *Proceedings of the 18th MIC Conference*, 2000. pp.55-62.
- Mosby's Medical Dictionary. St. Louis, Mosby Elsevier, 2013.
- O'Rahilly, R. Anatomical terminology, then and now. *Acta Anat. (Basel)*, 134(4):291-300, 1989.
- Panourias, I. G.; Stranjalis, G.; Stavrinou, L. & Sakas, D. E. The ancient Hellenic and Hippocratic origins of head and brain terminology. *Clin. Anat.*, 25(5):548-58, 2012.
- Panourias, I. G.; Stranjalis, G.; Stavrinou, L. C. & Sakas, D. E. The Hellenic and Hippocratic origins of the spinal terminology. *J. Hist. Neurosci.*, 20:177-87, 2011.
- Pawlina, W. & Drake, R. Moving forward with *Terminologia Anatomica*. *Anat. Sci. Educ.*, 2(3):93, 2009.
- Polackova, G. Synonymy of medical terminology from the point of view of comparative linguistics. *Bratisl. Lek. Listy*, 102(3):174-7, 2001.
- Rosse, C. *Terminologia Anatomica*: considered from the perspective of next-generation knowledge sources. *Clin. Anat.*, 14(2):120-33, 2001.
- Schulze, P. & Donalies, C. *Anatomisches Wörterbuch*. Lateinisch-Deutsch/Deutsch-Lateinisch. 8. Aufl. Stuttgart, Thieme, 2008.
- Smith, S. B.; Carmichael, S. W.; Pawlina, W. & Spinner, R. J. Latin and Greek in gross anatomy. *Clin. Anat.*, 20(3):332-7, 2007.
- Sprumont, P. Anatomical terms: towards development of Terminologies (terminogenesis). *Eur. J. Anat.*, 20(3):249-80, 2016.
- Stamatakos, I. *Dictionary of the Ancient Greek language*. Phoenix, Athens, 1972.
- Stedman, T. L. *Stedman's Medical Dictionary for the Health Professions and Nursing*. Philadelphia, Lippincott Williams & Wilkins, 2005.
- Strzelec, B.; Chmielewski, P. P. & Gworys, B. The *Terminologia Anatomica* matters: examples from didactic, scientific, and clinical practice. *Folia Morphol. (Warsz)*, 76(3):340-7, 2017.
- Vogl, A. W. Awareness of and access to a unified terminology by anatomists. *Anat. Sci. Educ.*, 2:139-40, 2009.
- Wulff, H. R. The language of medicine. *J. R. Soc. Med.*, 97(4):187-8, 2004.

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