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TERMINOLOGY ROOTED IN MYTHOLOGY

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Abstract: *Various medical terms are rooted in Greek in Roman mythology. The names of mythological figures such as Aphrodite, Hygeia, Morpheus, Narcissus, Priapus, or Thanatos, to name just a few, gave birth to terms such as aphrodisiac, hygiene, morphine, narcissism, priapism, thanatology. Achilles heel is derived from the myth of Achilles, in common language referring to one's physical vulnerability. This paper investigates a small corpus of medical articles in order to identify collocations built with the name of the mythological figure of Achilles.*

Keywords: *terminology, medical terms, mythology*

Introduction

In order to build the research database for this paper, a PubMed query was performed. PubMed is a free resource which supports the search and retrieval of peer-reviewed biomedical and life sciences literature. The database contains over 30 million citations and abstracts of peer-reviewed biomedical literature with full text links, when available, to source journal websites.

The search criteria in the PubMed database were the following:

- article types: journal article
- text availability: free full text
- publication dates: from 2019/01/01 to 2020/02/22
- species: humans
- languages: English
- journal categories: core clinical journals.

The query returned seven papers based on the search criteria above containing the term "achilles" of the 13698 items available in the database. The low number of the search results is due to the narrowing of the publication period. Of the 7 papers, 2 are observational studies, 1 is a clinical case report, 1 is a systematic review and meta-analysis, 2 are randomised clinical trials, and 1 is a research article. None of the papers was published in 2020. The articles were authored by researchers from China, Korea, Germany, the Netherlands, the United States of America, and the United Kingdom. Of the 7 papers, 1 only contained a single occurrence of the word, however, being the name of one of the collaborators, the article was ultimately excluded from the database, the final results reflecting the occurrences in the 6 remaining articles, the titles of which will not be included here for citation reasons.

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Collocations with the term *Achilles*

Because the focus of this paper does not lie in identifying the single term "Achilles", the six remaining articles were manually processed for phraseology identification and extraction. The following collocations were found (listed alphabetically):

- Achilles region
- Achilles rupture
- Achilles tendinitis
- Achilles tendinopathy
- Achilles tendon
- Achilles tendon exposure
- Achilles tendon inflammation
- Achilles tendon lesion
- Achilles tendon membrane
- Achilles tendon repair
- Achilles tendon rupture
- Achilles tendon rupture pain score
- Achilles tendon rupture recovery
- Achilles tendon rupture score
- Achilles tendon thickness
- Achilles tendon thickness measurement
- Achilles tendon tissue

Mythological background

However, a short look into Greek mythology may cast some light over the reason why the name of the mythological figure collocates with tendon. The idea of "Achilles' heel" was introduced in common use through the Iliad and it is also the root of "Achilles tendon", although the body structure has the medical name of *calcaneal tendon*.

The first recorded use of the term "Achilles tendon" belongs to Philip Verheyen (1647-1710). Before him, it had been called the *tendo magnus*, that is, big tendon, but the anatomist referred to it as the *chordo Achillis* in an anatomy text he published in 1708. Later, the famous German physician and anatomist Lorenze Heister (1683-1758) named it *tendo Achillis*.

According to mythology, Achilles was born to a mortal father, Peleus, and a goddess mother, Thetis, a sea nymph, and was the youngest of the seven children. Thetis was reluctant to the idea that her children would be raised as mortals, thus, in order to make them immortals, every night she placed them inside burning fire or submerged them in boiling water and fed them divine ambrosia. Thetis would hold Achilles by his ankles when subjecting him to fire, this being his only body part that was vulnerable, in other words, mortal. While all his siblings deceased because of the process, Achilles was saved by his father. According to another story, his mother would hold Achilles by the heels whenever dipping him into the River Styx. Etymologically speaking, the name Achilles consists of the negating suffix a-, meaning "no, not" and *cheilos*, meaning "lips." Thetis wanted to name her son Achilles because he had not yet once suckled on his mother's breast before she returned to her home in the sea.

Achilles's deadly mistake was telling Polyxena about his weak point. Polyxena, a princess of Troy, whose brother, Hector, had been murdered by Achilles, told the secret to Paris, another brother of hers. Under the command of Paris, the archer Apollo shot the arrow through Achilles's heel his only vulnerable body art.

Descriptions of the collocations

In terms of the frequency of the collocations identified in the corpus, "Achilles tendon" prevails. However, some other ones may need further explanations. While in common language Achilles heel describes somebody's weakness, the medical term Achilles tendon, also called calcaneal tendon or heel cord, a tough band of fibrous tissue, is the strongest and largest tendon of the human body arising from the strong calf muscles which raise the heel and lift the sole of the foot from the ground. It inserts on the calcaneus, also called heel bone in common language, which is the largest of the tarsal bones and which may be easily palpated (Martini et al. 2012: 205).

Anatomically speaking, tendons are an example of connective tissue proper, namely, connective tissue with many types of cells (Martini et al. 2012: 64). Tendons consist almost entirely of collagen fibres which run along the longitudinal axis of the tendon. Their role is to connect skeletal muscles to bones and cartilage.

The Achilles tendon is composed of approximately 90% type I collagen (Freedman et al. 2014). The large gastrocnemius muscle of the calf and soleus muscles share the Achilles tendon which inserts on the calcaneus (Martini et al. 2012: 315). If the Achilles tendon is prone to injury, it is because it has a limited blood supply and it is exposed to high tensions.

The study of the corpus revealed the use of the two collocations Achilles rupture and Achilles tendon rupture with identical meaning. The Achilles tendon can be partially or completely ruptured, and ruptures can be proximal, distal, or central. According to Kader et al. (2002) and Maffulli et al. (2005: 187), most Achilles tendon ruptures are a result of sporting activities (44-83%), especially those that incorporate quick changes in direction, such as football, tennis, and squash. However, there are underlying factors as well such as intrinsic structural, biochemical, and biomechanical changes related to ageing, poor vascularity, gender, previous injuries, as well as footwear. The authors state that the first description of the injury is attributed to Hippocrates who associated it with symptoms such as acute fevers, choking, the injury eventually leading to death. Ambroise Paré (1510-1590), a French barber surgeon, the greatest surgeon of his century and surgeon to four kings of France ((Mostofi 2005: 261) recommended strapping a ruptured Achilles tendon with bandages dipped in wine and spices (Maffulli et al. 2005: 187).

Achilles tendinopathy (Maffulli et al. 2005: 201) is characterised by pain and swelling arising from overuse and is encountered in runners (11%), dancers (9%), and tennis players (2%), but may also affect nonathletes. Sufferers from Achilles tendinopathy are at risk for long-term morbidity with unpredictable clinical outcome. While the aetiology of Achilles tendinopathy remains unclear, there are several underlying factors that lead to the condition: excessive loading of the tendon during vigorous athletic activity, tendon vascularity, age, gender, body weight, and even height.

Welsh & Clodman (1980) distinguish several entities which are called Achilles tendinitis, however, it basically comes down to a painful disabling syndrome due to local inflammation in the Achilles tendon resulting in a sharp pain in the heel tendon while running or walking, but not at rest. According to the authors, there is evidence that tendinitis is a local inflammatory response to the effects of microfractures of the tendon. The condition frequently occurs in runners and people involved in vigorous sporting activities. Achilles tendinitis and Achilles tendon inflammation are phrases used synonymously.

Achilles tendon rupture is frequently encountered as a result of sporting activities According to a group of Chinese researchers (Li et al. 2017), there are various ways of repair, such as conservative treatment, percutaneous or open repair, and minimally invasive repair techniques. Yang et al. (2018) also list mini-open repair and augmentative repair in the group of surgical procedures. Symptoms of Achilles tendon rupture are sudden increase in pain around the heel, weakness, poor balance, and limited walking distance. As in the case of other Achilles tendon problems, other contributing factors, apart from sporting activities, may be gender, drugs, intrinsic structural variations, and biomechanical changes related to ageing.

The Achilles tendon rupture pain score, also called Achilles tendon total rupture score (Nilsson-Helander et al. 2007) was developed due to the need for a patient-relevant instrument to evaluate outcome after treatment in patients with a total Achilles tendon rupture. Based on the significance threshold, Nilsson-Helander et al. developed the ATRS instrument concluding that it has high reliability, validity, and sensitivity for measuring outcome after treatment in patients with a total Achilles tendon rupture.

The thickness of the Achilles tendon can be measured in various ways, however, a popular and non-invasive technique is high-resolution sonography. Koivunen-Niemelä and Parkkola (1995) found that age and gender did not influence the thickness of the Achilles tendon in comparison with height, body mass index, or the size of the foot. Pang and Ying (2006), studying a group of 40 subjects, found that the mean thickness of the Achilles tendon was 5.1 ± 0.63 mm (range 3.8-6.9 mm) with no relation to different age groups.

While other tendons around the ankle have a synovial sheath, a two-layer membrane envelops the Achilles tendon. This membrane, which is called paratenon and functions as an elastic sleeve, is vascular and originates from the deep fascia of the leg (Kader et al. 2002, Momose et al. 2002).

The Achilles region, or the Achilles tendon region, is the area of the posterior heel and the proximal part towards the calf, covering the Achilles tendon which is the largest tendon and has the highest resistance in the human body. The Achilles region is easily injured and defects in this area are a challenge in lower limb surgery.

Although they are not very frequent (Hoffmann et al. 2006), tendon and ligament lesions (especially rotator cuff, Achilles tendon, and patellar tendon defects) rank as the most common soft-tissue injuries (Juncosa-Melvin et al. 2005). There are various types of tendon injuries such as tendinopathy, tendinitis, tendinosis, partial tears, complete ruptures, etc. Repair of such ruptures and tears may involve surgery and tissue engineering as well.

Conclusion

Etymologically, many medical terms can explained in relation to mythological figures. Much mythological information is based on Homer's epic poems the *Iliad* and the *Odyssey*, as well as *Theogony* by Hesiod. Achilles, one of the greatest heroes of the *Iliad*, is the origin of the common term "Achille's heel" which describes the most vulnerable point of one's body.

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