

## The Greek hero Achilles and his mysterious death: transdisciplinary analysis of the gouty hypothesis

E. Armocida<sup>1,2</sup>, F.M. Galassi<sup>2,3</sup>, S. Melintenda<sup>2,4</sup>, M. Martini<sup>5</sup>

<sup>1</sup>Department of Medicine and Surgery, University of Parma, Italy;

<sup>2</sup>FAPAB Research Center, Avola, Italy; <sup>3</sup>Archaeology, College of Humanities,  
Arts and Social Sciences, Flinders University, Adelaide, Australia;

<sup>4</sup>Specialisation School in Archaeology, University of Catania, Italy;

<sup>5</sup>Department of Health Sciences, University of Genova, Italy.

---

### Abstract

*Achilles is a character of Greek mythology whose deeds are mainly told in the Iliad by Homer. Achilles distinguishes himself on the battlefield of Troy with his dexterity and strength, appearing invincible, yet he dies wounded by an arrow in his heel. How could an arrow shot to the heel kill anybody, no matter whether vulnerable or invulnerable? Many researchers have tried to give a medical explanation to this mythological conundrum starting from a literary interpretation of the Homeric text: poisoning, infection, allergy, haemophilia or thyroid storm. In a way, the oldest medical interpretation was suggested by Lucian of Samosata (ca. 120 to after 180 AD). In his parodic tragedy "Gout", he claimed that the warrior actually died of gout. In this article we consider the gouty hypothesis and analyse the clinical aspects that support it.*

---

### Key words

history of medicine, gout, paleopathology, mythology, Achilles tendon

Emanuele Armocida, MD,  
Resident in Occupational Health  
Francesco Maria Galassi, MD  
Sebastiano Melintenda, MA  
Mariano Martini, PhD

Please address correspondence to:  
Emanuele Armocida,  
Via Gramsci 14,  
43126 Parma, Italy.  
E-mail:  
emanuele.armocida@studio.unibo.it

Received on March 22, 2020; accepted  
in revised form on April 27, 2020.

© Copyright CLINICAL AND  
EXPERIMENTAL RHEUMATOLOGY 2021.

Anatomy is full of eponyms that can be attributed to anatomists and physicians who first described specific anatomical parts. However, there is a tendon bearing the name of a Greek mythological character rather than a scientist's, the so-called Achilles tendon. Achilles (ancient Greek: Ἀχιλλεύς; Latin: Achilles) is the character whose deeds are told in the poem the *Iliad* (8<sup>th</sup>–7<sup>th</sup> centuries BC) traditionally attributed to Homer. Achilles distinguishes himself on the battlefield of Troy for his strength, dexterity and bravery, appearing almost invincible, yet he ultimately dies wounded by an arrow shot by his Trojan foe, Paris, in his heel. Achilles' death, unlike the remainder of his deeds in the Trojan war, is not described in this poem, and can be found in later Graeco-Roman literary works.

Over the years historico-medical research has focused on the potential biomedical implications behind Achilles' vulnerable spot and *causa mortis*. Alternative interpretations stem from several versions of Achilles' story that may be found in the classical literature, a fact that can be explained with the many shapes taken by Achilles's character over the centuries. Besides the Homeric poems (including book XI of the *Odyssey*, where another Greek hero, Odysseus, the Latin Ulysses, meets the shadow of Achilles in the Underworld), Achilles features in a number of prominent ancient works, namely the *Cypria*, the *Aethiopis* and the *Achilleid*, not counting minor compositions and collections of myths. The most widely known version is the chronologically most recent one, the *Achilleid* by the Latin writer Publius Papinius Stantius (40–96 AD), an epic text dedicated to the biography of Achilles, left unfinished due to the premature death of its author. According to Statius, the heel was the body part by which Achilles' mother Thetis held his son when she washed him in the waters of the River Styx to make him invulnerable.

It was from this legend that Philip Verheyen (1648–1710), Professor of Anatomy at the University of Louvain, first adopted in 1693 the anatomical term “chorda Achillis”, which was soon changed by Heister (*Compendium*

*Anatomicum*, no. 174) to “tendo Achillis”, or, in its anglicised form, “tendon of Achilles”, to designate the powerful tendon end of the gastrocnemius and soleus muscles. Joseph Hyrtl (1811–1894) recorded Verheyen's adoption of the term and briefly discussed the history of the literature on the subject (1). However, it appears impossible that Achilles, or whoever his mortal prototype may have been, really died of an arrow shot to his heel. Perhaps a different, more rational, explanation can lie behind the myth.

One of the proposed interpretations of Achilles' death had anatomical bases, especially vascular ones since there could be the possibility that the wound in his heel really killed the hero (2).

Several hasty hypotheses claim that the heel wound contributed to the death of Achilles ultimately caused by poisoning, infection, allergy, haemophilia or thyroid storm (*i.e.* pain and stress) (3). Moving away from a non-interpretative reading of the facts, other authors have hypothesised that the heel wound induced a chronic disability in Achilles that led him to lose his invincibility, thus murdering the myth itself (4).

It is useful to research the bases for the mythopoiesis of Achilles in the most ancient aetiopathological hypotheses suggested by the ancient literature, to understand the facts described by the epic authors.

In this regard, in a way, Lucian of Samosata (ca. 120 to after 180 AD) gives us a new interpretation of Achilles' death claiming in his parodic tragedy *Gout* that the famous warrior died of gout (5). The Syrian author notably used to mock the ancient myth and its characters, thus, as a first interpretative line, his explanation can be read as a form of rationalisation of Achilles' figure. Another important point is the increasing prevalence of gout in the ancient Roman population in the days of the Empire, as vividly described by authors such as Aretaeus of Cappadocia (fl. 2<sup>nd</sup> century AD), who wrote in his *De causis et signis acutorum et diuturnorum morborum* [II, 12]:

“*Arthritis* is a general pain of all the joints; that of the feet we call Podagra; that of the hip-joint, Schiatica; that of

Competing interests: none declared.

the hand, Chiragra [...] The most common age is after thirty-five; but sooner or slower according to the temperament and regimen of every one. The pains then are dreadful, and the concomitants worse than the pains; fainting even upon touch, inability of motion, loss of appetite, thirst, restlessness. But, if they recover partly, as if escaped from death, they live dissolutely, are incontinent, open-handed, cheerful, munificent, and luxurious in diet; but partly, as if they would (not?) again escape from death, they enjoy the present life abundantly. In many cases the gout has passed into dropsy, and sometimes into asthma; and from this succession there is no escape" (6).

Throughout history gout has been referred to as the "disease of the kings", and clearly associated with those people who had the opportunity to eat large quantities of meat, a food rich in protein, therefore considered quite an important component of a warrior's diet (7). With particular reference to the Mycenaean world, archaeological research has been able to prove that bovine meat consumption was limited to the upper crust of the Tiryns (Argolis, Peloponnese), as well as wild boar and deer, products of hunting, were the preserve of the ruling classes (8).

Gout is a chronic disease with periodic exacerbations characterised by intense and disabling pain caused by inflammation due to the intra- and extra-articular deposit of monosodium urate (MSU) crystals, residues of purine catabolism. MSU crystal deposition in tendons is a frequent manifestation of extra-articular gout, more frequently affecting the Achilles, patellar, peroneal, and flexor and extensor digitorum tendons. Microcrystalline deposits can localise in the body of the tendon, around, or even at the enthesis, frequently in more than one location (9).

Recently, Dalbeth and colleagues have evaluated the frequency and pattern of tendon and ligament involvement in the foot of tophaceous gouty patients using dual-energy computed tomography (DECT). These authors observed that tendon involvement amounts to 10.8%, and the most affected tendon is indeed

the Achilles one (10). The presence of MSU crystal deposits in the body of the tendon and enthesis together was more frequently observed than that on each one taken individually (10).

A relationship between the breaking of the Achilles tendon and high levels of serum uric acid has previously been proposed (11) as much as between the deposition of crystals in the tendon and its rupture (12). Although Achilles was probably thirty-three years old when he was killed (13) and gout is more prevalent at more mature ages, this disease can be present in the second and third decades of life, in that case being often associated with background genetic issues (14). Therefore gout may have been the cause of Achilles' vulnerability that ultimately led the hero to disabling pain or acute injury.

The legend of Achilles' invulnerability is not found in the Homeric poems, but is attested much later in the unfinished work of Publius Papinius Statius (45–96 AD). In the Trojan War the only mortals who could claim to have succeeded in hurting Achilles, though slightly, were the following:

- Helenus, Priam's son and Hector's brother, saved the latter interposing himself between him and Achilles in their first fights in open field and could wound the Achaean hero on his wrist/hand – depending on the translator – with an arrow shot from the ivory arch given to him personally by the god Apollo (15).
- Asteropeios, a young leader and an ally of the Trojans, whose extreme deeds are told in the *Iliad*. He tried to hit Achilles by throwing two spears at the same time, one of which wounded him in the elbow (16).
- Hector, according to Homer, never inflicted physical damage to Achilles.

However, according to another source, the Trojan hero managed to surprise Achilles in their last open fight by piercing his thighbone with his spear (17). Interestingly, wrist/hand, elbow and distal extremity of the femur are all anatomical sites affected by gout (18). In conclusion, we believe that the theory of Lucian of Samosata should be seriously considered when assessing

Achilles' mythopoietic process, aware that it stands both biomedical (physiopathological, clinical, psychological) and socio-anthropological scrutiny.

In addition, active cooperation between historians and classicists allows researchers to expand the boundaries of studies on antiquity, in that the reanalysis of mythologies and folk traditions permits to identify pathological elements that played a role in the mythopoietic process, thus indirectly offering evidence for the great social and cultural impact of certain diseases, as well a certain hint of their frequency, in ancient times (19, 20).

## References

1. COUCH JH: The Tendon of Achilles. *Can Med Assoc J* 1936; 34: 688.
2. ANAGNOSTOPOULOU S, MAVRIDIS I: Achilles' death: anatomical considerations regarding the most famous trauma of the Trojan War. *J Trauma Acute Care Surg* 2013; 74: 946-7.
3. LEE CC, JACOBS RL: Achilles (the man, the myth, the tendon). *Iowa Orthop J* 2002; 22: 108-9.
4. RAKIC VS: Using the Literature to Understand Achilles' Fate. *Ostomy Wound Manag* 2016; 62: 38-42.
5. TOOKE W: *Lucian of Samosata from the Greek with the omments and Illustrations of Wieland and others*. London: Longman, Hurst, Rees, Orme, and Brown, 1820:754.
6. ADAMS F (Ed.): *Aretaiou Kappadokou Ta Sōzomena: The Extant Works of Aretaeus, The Cappadocian*. Boston, London, The Sydenham Society 1856: 362.
7. FORNACIARI A, GIUFFRÀ V, ARMOCIDA E, CARAMELLA D, RÜHLI FJ, GALASSI FM: Gout in Duke Federico of Montefeltro (1422-1482): a new pearl of the Italian Renaissance. *Clin Exp Rheumatol* 2018; 36: 15-20.
8. CULTRARO M: *I Micenei*. Roma, Carocci editore, 2006: 87.
9. LUCIO VENTURA-RÍOS L *et al.*: Tendon involvement in patients with gout: an ultrasound study of prevalence. *Clin Rheumatol* 2016; 35: 2039-44.
10. DALBETH N: Tendon involvement in the feet of patients with gout: a dual-energy CT study. *Ann Rheum Dis* 2013; 72: 1545-8.
11. DODDS WN, BERRY HC: The relationship between Achilles tendon rupture and serum uric acid level. *Injury* 1984; 16: 94-5.
12. PG MAHONEY PG: Spontaneous rupture of the Achilles tendon in a patient with gout. *Ann Rheum Dis* 1981; 40: 416-8.
13. BRESLOVE D: How Old were Achilles and Neoptolemus. *The Classical Journal* 1943; 39: 159-61.
14. DIEPPE PA: Investigation and management of gout in the young and the elderly. *Ann Rheum Dis* 1991; 50: 263-6.
15. PHOTIUS: Biblioteca di Fozio, patriarcha di Costantinopoli vol II, in COMPAGNONI G

- (ed.) *Biblioteca scelta di Opere Greche e Latine*, vol 46. Milano, Giovanni Silvestri, 1836: 131.
16. HOMER, Iliad, book XXI, verse 147 et seq.
17. COMPAGNONI G: *Ditti Cretese e Darete Frigo, Storici della Guerra Trojana volgarizzati dal Cav. Compagnoni*. Milano, Gio. Battista Sonzogno, 1819: 272.
18. MONU JU, POPE TL: Gout: a clinical and radiologic review. *Radiol Clin North Am* 2004; 42: 169-84.
19. RÜHLI FJ, GALASSI FM, HAEUSLER M: Palaeopathology: current challenges and medical impact. *Clin Anat* 2016; 29: 816-22.
20. ARMOCIDA E, BÖNI T, RÜHLI FJ, GALASSI FM: Does acromegaly suffice to explain the origin of Pulcinella? A novel interpretation. *Eur J Intern Med* 2016; 28: e16-7.