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Electric current to cure arthritis and cephalaea in ancient Greek medicine

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ABSTRACT

Physicians in ancient Greece applied electricity as a therapeutic mean, through a living, vibrant electrical device: a fish called “Narce”, or Torpedo fish, or Electric Ray. With the intent to register all knowledge about the appliance of electricity by the ancient Greek physiatrists, an indexing of all ancient philosophical and medical sources took place. Aristotle, Thales and Theophrastus understood magnetism partially, and electricity remained unnamed. Hippocrates, Skivronios Largos, Pliny and Dioscorides used the electric fish in various medical applications including arthritis, and cephalgia, with local placement of a living Narce. Galen testified for the method’s efficiency. Surprisingly, electric current had been widely used in physical medicine by the ancient Greeks.

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INTRODUCTION

Arthritis was a well known nosological entity since the Hippocratic era, and both yellow bile and the mucus (the 4 humours theory) were to be blamed for it.^{1,2} According to Hippocrates, those two humours, when set into motion to be settled inside the joints, cause high concentration of synovial fluids; resulting in local bulging and inflexibility, thus arthritis.^{2,3} Although some centuries later Aretaeus, famous for his vivid descriptions of numerous diseases, and an authority in anatomy and physiology (for the standards of his era), gave the first complete definition of arthritis, surprisingly, he had emphatically noted that this was a disease of an unknown origin, and that only the gods could unveil its causes.⁴ Cephalaea or cephalgia (Greek: κεφαλαγία, English term: migraine = Greek term: ημικρανία), head's affliction, known since the ancient Mesopotamian civilizations,⁵ was also attributed to the abnormal concentration of fluids inside the head, resulting in pain and disorientation. It was a common illness, mainly with a sudden appearance, persistent and recurrent.^{6,7}

Electricity in ancient Greece was a known phenomenon as well. Ancient Greeks attributed to god Zeus (Greek: Δίας), father of gods and men, the thunderbolt as the ultimate sacred weapon (**Figure 1A**).^{8,9} Ancient Greek philosophers had tried to understand amber's electromagnetic properties and thus to interpret the divine thunderbolts' mystery. Soon, electric currents had been used in medicine to treat arthritis and local swelling and pain, and cephalaea as well. The ancient Greeks used the electric shocks from the fish "Narce" (Greek: Νάρκη, English: Torpedo fish), an Electric Ray fish, to treat headaches and arthritis (**Figure 2**).⁹⁻¹¹

Many historians believe that the term "narce" always meant sedation, local, or general (narce=sedation ≈ anaesthesia in Greek). In fact, in most palliative cases, it meant simply the usage of the "magical" electric fish, also known as "moudiastra" (Greek: μουδιάστρα, Eng-

lish: the fish which causes numbness), or marmorata.¹¹ Our study unveils the true meaning of the term "narce" inside the ancient Greek medical literature, presenting the usage of electric current in rheumatology and physical rehabilitation in ancient Greece.

ARTHRITIS IN ANCIENT GREECE

Aretaeus masterfully noted, "arthritis is the most common disease of all the joints, most common of the four extremities' joints. For the joints of the foot it is called "podagra" (Greek: ποδάγρα, πόδι = foot), of the hip "ischialgia" (Greek: ισχιαλγία, ischio = hip), of the hand "cheiragra" (Greek: χειράγρα, cheira = hand). The pain may be acute due to a new cause, or chronic, exacerbated due to any disease", and concluded by giving a macroscopic portrait of the joint infliction, "all joints' tendons, and ligaments, all which derived from the bones, or all which grow inside them, and lastly the bones participate in the inflicted joint are all damaged. For the joints of the vertebrae column (most probably, as it is not clearly referred), all nerves, called tones (Greek: τόνοι), are also damaged due to the arthritis. When arthritis is appearing in the small joints, is of non-malignant character but unexpectedly, in the case of the bigger joints is of heavier prognosis, but stays only to those inflicted."⁴

Hippocrates informed us about arthritis' main cause. The humours imbalance was to be blamed. Fluids gathering inside the joints causing oedema, local pain, stiffness, acute severe pangs in the case of fluids petrification, and in some times fever, were the symptoms described.² Cold compresses, olive oil, elleboro (Lat-



Figure 1. A: Etruscan painted pottery, Zeus, ca 450 BC (left). **B:** Athena emerged from Zeus' head, engraving from the Latin emblem book *Mikrokosmos: Parvus Mundus*, 1579 (right).



Figure 2. A Campanian red-figure fish plate, depicting Narce, ca 4th century BC.

in: helleborus niger), suppositories, enemas, laxatives (boiled milk serum, or donkey milk), local compresses with vinegar, and sea water (washout and exercises-physiotherapy-thalassotherapy) were used for the joints' palliation. As a painkiller, Hippocrates recommended the following prescription, "for aching joints, put up in swollen joints poultice of salt mingled with water, and let it there tied for three days, then when you remove it, you pound raw red nitro (soda ash) and a little honey and treat them like salt, for the same time period you put in a pot the crushed salt, and then you sprinkle with a little alum (astringent soil: contains possibly aluminum and hydrochloric acid), put the pot onto the fire, sprinkle again with salt and alum and let it boil for a day and night", poultice is used with repeated use on joints during periods of paroxysmal pain.^{2,12,13} When oedema persisted, he suggested the implication of medical cups (Greek: βεντούζα) on one of the joints and then pull out some blood, by boring the knee with a triangular needle to relive the intra-joint pressure (humours excess).¹⁴⁻¹⁶

Aretaeus recorded the main joints afflicted by arthritis, thus, little joints of both the upper and lower extremities, knees, cervical spine, sacrum and jaw joint. For him, arthritis was an incurable disease, an entity that accompanied the sufferers until their natural death.⁴ Radishes, cold compresses, thalassotherapy, attar, wine, sideritis, cucurbita lagenaria, plantago, roses, symphytum officinalis, quinquifolium and allium porum (**Figure 3**) were used by Aretaeus as palliative measures.¹⁷

CEPHALAEA IN ANCIENT GREECE

Cephalaea was firstly described in ancient Egyptian papyri (1500-1200 BC), and was later on attributed by the ancient Greek medico-philosophers to the humours concentration in the head area.^{6,7} In ancient Greek Mythology, cephalaea was firstly mentioned, afflicting Zeus just before goddess Athena emerged from his head during her birth (**Figure 1B**).¹⁸ Heat, laxatives and ervum ervillia were used by Hippocrates to cure it.¹⁹ Both Hippocrates and Aretaeus, proposed good dietetic regime and exercise.¹

ELECTRIC CURRENT AS A CURATIVE METHOD

Aristotle (384-322 BC) studied amber, regarding it similar to myrrh, gummy and incense, as a kind of resin to be compressed at high temperature and to be hardened with the evaporation of the moisture. He had furthermore acknowledged about its attractive power.²⁰ The pre-Socratic philosopher Thales of Miletus (684-546 BC), was the first to attempt an experiment for the development of electricity by friction and describe the properties of amber. They both attributed the cause of the attractive force of the amber to the fact that it is consisted of animated elements.²⁰⁻²¹ Theophrastus

from Eresos (ca 371-287 BC), among others, referred to a different element called lygourio, which after friction on fabric attracts elements such as hair, feather or small straw.²² Ancient Egyptians had used electric catfish from the Nile, the *Malapterurus electricus* (**Figure 4A**), to cure gout and migraine.²³ Electricity remained unnamed, and not well understood, but had been applied to treat people's ailments and relieve pain due to the innovative thinking of the ancient Greek medicophi-losophers, who systematized its employment.¹⁰ Hippocrates had noticed that when someone touches the "Narce" fish (**Figure 4 B,C,D**), it caused electric shocks and numbness, which is probably, the first comment on the phenomena (Greek: νάρκωση) of animal electricity. Hippocrates handled this living electrical appliance as a very effective therapeutic agent in knee joints and cervical spine.²⁴ Aristotle observed that the torpedo fish could bring numbness to other fish that

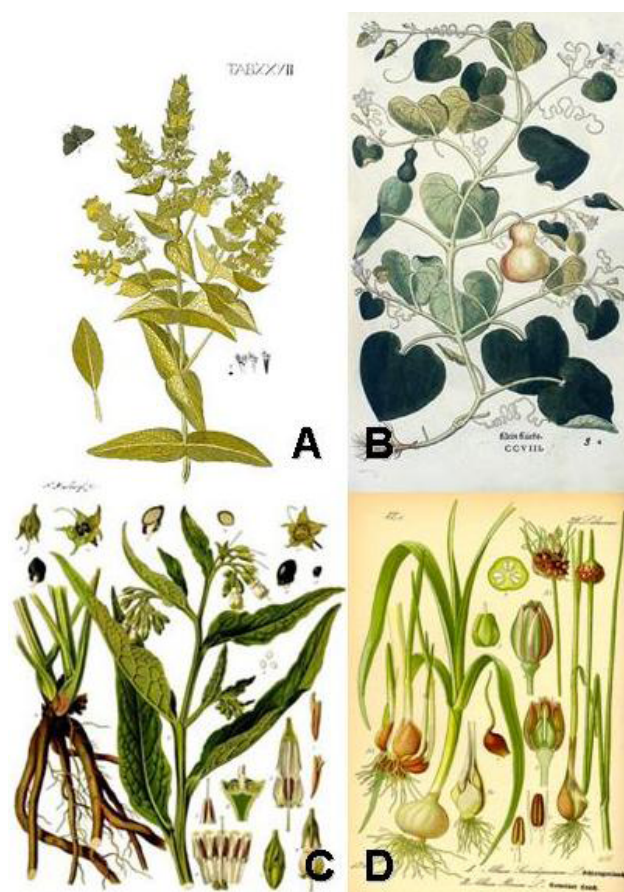


Figure 3. **A:** Illustration of Sideritis Perfoliata, Afbeeldingen van zeldzame gewassen, 1775. **B:** Illustration of cucurbita lagenaria, Dom Charles Plumier, 1703. **C:** Illustration of symphytum officinalis Jacob Sturm, Deutschlands Flora in Abbildungen, 1796. **D:** Illustration of allium porum, Otto Wilhelm Thome, Flora von Deutschland, 1885.

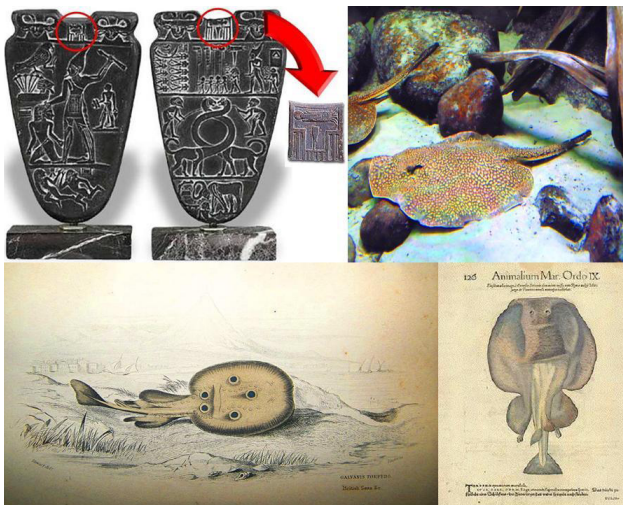


Figure 4. A: The extraordinary Palette of King Namer (ca 3100 BC), depicting the electric catfish in a central location on both sides, revealing electricity's significance for the Egyptian civilization, discovered by J.E. Quibell at Hierakonpolis in 1897-1898 (top left). **B:** Photo depicting Marbled electric ray of the torpedo family, Berlin Aquarium, Tsoucalas Gregory, personal collection, 2016 (top right). **C:** Narce, antique steel engraving, published between the period 1833-1843 by W.H. Lizars, Edinburgh for "The Naturalist's Library" by Sir William Jardine, fine hand colour as published (bottom left). **D:** Torpedo Ray, woodcut, ca 1580. (bottom right).

hits, making them easy prey.²⁵ Plato (ca 428-347 BC),²⁶ Plutarch (45-120 AD),²⁷ Sextus Empiricus (ca 160-210 AD),²⁸ and Alexander of Aphrodisias (ca 200 AD)²⁹ had also made the same observation.

Scribonius Largos (1st century AD), suggested that in cases of arthritis a living blacken torpedo fish was to be put under the patient's foot and to be left there until the patient felt numbness on the entire leg as high as up the knee (**Figure 5A**). He wrote respectively, "by this method we eliminate the pain for the moment being and cure evil pain in the future".^{21,30} The first person known to have been cured by electricity was Anthero, a freed slave of the Emperor Tiberius Claudius Nero Caesar (42 BC-37 AD). Anthero's enjoyment of liberty was marred, however, by his sufferings from gout. One day whilst walking the seashore he stepped on a flat, medium-sized fish, which is now known to be capable of delivering a substantial, sometimes lethal, electric shock of approximately 100-150 volts. One effect on Anthero, after the initial numbing had subsided, was to free him of his gout. Thus, he had certified, even unwittingly, Narce's healing properties.³¹ Pliny (23-79 AD), described in detail the properties of the torpedo fish. He mentioned that even from a distance the strongest

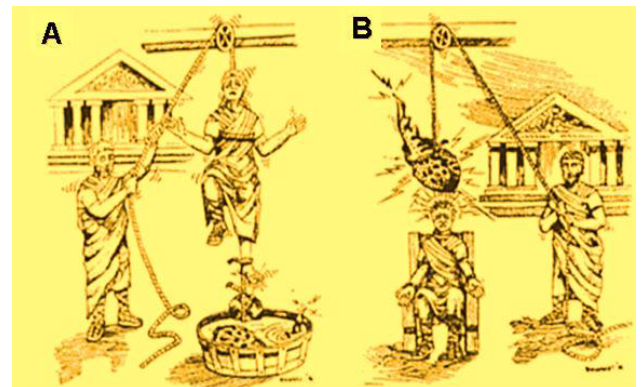


Figure 5. A: Narce application for the pain in the lower extremity. **B:** Narce application for the cephalaea, 20th century, sketcher artist unknown.

hands could become numb. He considered Narce to be palliative, anti-aphrodisiac, soothing for the intestines, therapeutic for the spleen and the womb, effective for a fast birth only when the moon was situated in Libra.³² Dioscorides (ca 40-90 AD) recommended the in loco application of living torpedoes for the healing of severe cephalalgia (**Figure 5B**), as well as rectal prolapses.³³ Asclepiades of Bithynia (1st century AD), who flourished in Rome, employed Narce in inflammatory body regions.³⁰

Galen (ca 129-200 AD) confirmed the effectiveness of the treatment of cephalalgia in the following fragment: "he has promoted to put a Narce fish in contact with the head of a man who suffers, because he thought that the animal could have soothing properties, such as all that narcotize the senses. Actually, he says that the thought was proven to be correct." In addition, he had given evidence that Hippocrates also believed that Narce could heal average pain.³⁴⁻³⁵ Athenaeus (ca 200 AD) inside his treatise "Theriaca of Nicander of Colophon by Diphilus Laodicaea", described Narce and his electrical property to numb the hands when someone touched it. He had also mentioned that Clearchus of Soli in 250 BC wrote an extensive text titled "With regards to the Narce Fish".³⁶ Poet Oppian of Anazarbus (ca 175 AD) wrote a fragment "On Narce" in his poem "Fishery" (Greek: Αλιευτικά). Oppian called it the "cramp-fish," saying that "in its loins it hath a piece of craft, its strength in weakness: even two rays planted in its sides, one on either hand. If one approach and touch these, straightway it quenches the strength of his body and his blood is frozen within him and his limbs can no longer carry him but he quietly pines away and his strength is drained by stupid torpor."³⁷ At the same era, Nafkratitis the Athenian (2nd-3rd century AD), the eminent grammarian and prolific writer, was the first who pointed out that the term "numbness from

the Narce” was firstly met inside Homeric epic poems (Greek: “Νάρκησε δε χειρ επί καρπῶ”).³⁸

DISCUSSION-EPILOGUE

In Homer’s Iliad, the first written ancient Greek text, the first verse about the electric Narce fish may be found.³⁸ Since the origin of physical therapy, ancient Greek physicians used all elements of nature to treat and rehabilitate sufferers. It was not only aquatic therapy introduced since the Asclepius era, but a holistic regimen; gymnastics, hygiene, diet, herbs, minerals, animal kingdom, and the environment in general, that had been used in physicians’ favour.^{1,39} As most nosological entities in ancient Greek medicine required palliation, it was almost an obligation for the medico-philosophers of the era to discover innovative ways to treat acute or chronic pain. It is said that since circa 9000 BC, bracelets and necklaces of magnetite and amber were used to prevent headaches and arthritis.⁴⁰ The use of the Narce fish to locally electrify arthritis or to treat cephalaea had been applied since at least the third millennium BC.⁵

Although Narce was in use for almost five millennia, it was not until 1773, when the eminent Scottish physician and surgeon John Hunter (1728-1793) provided the best verbal and pictorial description of the Narce’s (he named the fish “torpedo fish” or “electric ray”) electrical organs to date. He emphatically wrote that they are made of about 470 perpendicular columns comprised at “either hexagons or irregular pentagons” separated by thin membranes.⁴¹ Narce, or Torpedo (commonly called camp fish), causes 100 electrical shocks/minute. This family of electric rays represent a group of rays, flattened cartilaginous fish with enlarged pectoral fins, comprising the order Torpediniformes. Narce, genus Torpedo, is known for being capable of producing an electric discharge, ranging from 8 to 220 volts, depending on the species, used to stun prey and for defence.⁴²

Plato compared Socrates (ca 469-399 BC) to a Narce, for his capability of electrifying his auditory. Narce then became famous, and it appeared that in severe and obstinate cephalaea, was laid on the aching head, or aching part of the body, and left there until it had thoroughly numbed it. The fish was probably wet occasionally with sea water, or immersed in it, otherwise it would soon have ceased to be “torpedo viva”.³⁰ Fish represented the first living electro-stimulation machines employed by man, and it was the ancient Greeks who introduced Narce to physical therapy; a progenitor of the modern Transcutaneous Electrical Nerve Stimulation (TENS).

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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