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From Observation to Diagnosis: The Rise of the Method in Medicine from the Papyrus Edwin Smith

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Abstract

This paper focuses on the pre-scientific method in ancient Egyptian medicine. Of particular interest in this regard is the Edwin Smith Papyrus, the most important source of surgical knowledge from the time of the pharaohs. This document describes 48 surgical cases and reveals a remarkable diagnostic methodology based on a phenomenological approach. Despite belonging to the prehistoric era of medicine and surgery, some of the document's theoretical principles for achieving effective diagnoses are philosophically remarkable, particularly the application of the logical process of abduction to determine potential treatments.

Keywords: Trauma; Injuries; surgery; Diagnosis; Medical examination; Treatment; Method; Intention; Phenomenology

A Matter of Method

The doctor-patient professional relationship is commonly based on a set of well-established practices. For example, during an in-person consultation, the physician is expected to ask about the patient's condition and symptoms, examine the overall health, and listen to and evaluate heart and respiratory function. Therefore, through a phenomenological approach based on these elements, the doctor can make a diagnosis, which is the first step towards effective medical treatment. As Jak [1] note: “Concretely, for the patients, doctor visits represent a central source of information to self-manage their illness as well as to adopt preventive and health-promoting behaviors.” Given this, it is important to acknowledge that each medical examination involves several fundamental logical steps through which information is acquired and organized in order to determine a potential pathology and the most appropriate treatment. Conversely, the existence of an established paradigm in treatment decision-making might be seen as a “pro forma and useless autonomy rituals.” [2]. This process, which is essential for generating a new knowledge, involves the examination and the correlation of multiple elements. Therefore, the systemic nature of medical practices must be recognised. From this perspective, diagnosis can be interpreted as an emergent property of the interaction between multiple systems, such as symptoms, patient self-description, practitioner examination and environmental conditions. This property transcends the individual components of these systems. A pivotal step in the cognitive process for reaching the diagnosis is abduction, a special inference, whereby, given an incomplete context of information (a cluster or symptoms), the subject (the doctor) introduces an element which is not present in the context, thereby rendering the data available explicable. Introduced in the philosophical debate by Peirce, abduction defined as the process of forming explanatory hypothesis. It is the only logical operation which introduces any new idea [3].

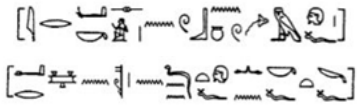
Although Peirce did not provide a systematic doctrine of abduction, from a logical point of view this mental operation can be viewed as "an epistemological instrument endowed with high cognitive efficacy in the comprehension of phenomena and objects of the world.” [4]. This passage is a highly creative step that depends upon how the doctor is able to connect multiple theoretical threads into a well-founded hypothesis. In short, a medical observation reveals the presence of a clearly established path for understanding the patient's reported discomfort and arriving at an appropriate treatment. Therefore, when discussing the doctor's visit, it is undoubtedly a matter of method. The Greek term 'method' (μέθοδος) combines the prefix 'meta' (μετά, meaning 'after' or 'beyond') and 'hodos' (ὁδός, meaning 'way',

'path', or 'journey'). This means that a method always requires intentional thinking and the awareness that it is possible to act by reflecting on the available data and finding a way out of the problem. It is surprising how finely written and methodologically refined the surgical cases collected in the Edwin Smith Papyrus are. Dating back to the 17th century BC, it is the oldest known medical treatise in history. Written in hieratic script, a cursive form of hieroglyphics, it was first translated and commented on by James Henry Breasted in [5]. The text is probably much older, dating from about the Sixth Dynasty (3000 BC), and the author has been suggested to be the physician and architect Imhotep. Reading the multifaceted cases examined by the papyrus, which mostly involve severe bone trauma, we are in awe of the authors' efforts to alleviate the suffering of wounded patients, whose injuries were primarily battlefield-related or due to critical working conditions on building sites. Recently, scholars of neurosurgery have shown renewed interest in the text, finding valuable insights into how Egyptian doctors dealt with spinal cord injuries. Although patient demographics, diagnostic techniques, and therapeutic options have changed considerably over time, the rationale documented for spinal injuries can still be regarded as state of the art for modern clinical practice [6,7]. From a logical point of view, all the cases examined in the Edwin Smith papyrus, whose translation has been recently updated [7,8], show the same frame. It will be highlighted in the following paragraphs.

Trauma in ancient Egypt: a case history

The cases collected in the Edwin Smith Papyrus generally follow a five-point schema: 1) Title, 2) Examination; 3) Diagnosis; 4) Treatment (unless the case is considered fatal and therefore untreatable); 5) Glosses (a dictionary of obscure terms employed in the discussion of the case, if any) [9]. The papyrus begins by describing an open skull fracture, which is likely to have been depressed, and which is associated with a tear in the overlying scalp. It is a severe condition that does not necessarily imply damage to the underlying brain [10]. The text kicks off by listing the type of injury sustained, followed by a detailed description of the injury. The goal is to identify a potential explanation and recommend a suitable treatment. The title of the case presented below is a crucial information and, at the same time, an accurate yet brief description of the trauma occurred. Its function is similar to that of the headline of a news article, which is expected to inform the readers without them having to read the text.

To read the hieroglyphs, one has to follow the direction of the signs, which, in this case, move from left to right. The next step for interpretation is transliteration, which is required for a scientific approach to the hieroglyphs: šsʿw wbnw m tp.f / ʿr n ḳš n dnn.t.f. The literary translation sounds as follows: “Instructions: Wound to the head, penetrating the bone of the skull”. Examining the text more closely, the term 'šsʿw' is used for 'instructions', while 'wbnw', accompanied by the determinative sign for blood flowing out of a surface, is used for 'wound'. The verb ʿr can also indicate 'to reach' or 'to arrive', a semantic trait rendered here by the determinative of the word w3t, meaning 'path' and 'greenery'. As previously mentioned, the title is self-explanatory, even if, as in the inaugural case of the papyrus, it lacks precision regarding the location of the wound or how the accident occurred. For Breasted, however, it was relatively straightforward to piece together the story of the traumatic event. “(…) it is evident that the whole injury has been produced by a violent blow with a weapon like a sword or battle axe (…) obviously such wounds are those of battle, and we must conclude that the surgeon had gained knowledge of such injuries while following the Egyptian armies (…) on the field.” [9]. The dialogical tone of the anamnesis, is an interesting feature to highlight. It begins with a detailed observation of the patient: “A man with a wound in his head that penetrates the bone of his skull, but without a gash.” (Transliterated: ir ḫ3.k s n wbnw m tp.f / ʿr n ḳš n dnn.t.f nḫ kf.t.f).



The colloquial tone suggests that medical knowledge emerged from a confrontation between peers. This is an interesting concept because it reveals the methodological strengths of medicine in ancient Egypt and how practitioners worked together as a team. We can speculate about the origin of the trauma. As Breasted suggested: “(…) it is evident that the whole injury has been produced by a violent blow with a weapon like a sword or battle axe (…) obviously such wounds are those of battle, and we must conclude that the surgeon had gained knowledge of such injuries while following the Egyptian armies (…) on the field.” [9]. The verbal construct ḫ3.k, in the first row of hieroglyphic signs derives from ḫ3i (in abbreviated form), and is translated using as "examine". It conveys the concept of measurement, and primarily used in the context of weighing grain or other materials. In the text, the author seeks to emphasise an act comprising two operations - visual and tactile - in order to provide the clearest possible depiction of the trauma experienced. The surgeon, therefore, observes the patient by reviewing the object of the examination – the wound – according to extension, depth, consistency, with an admirable exercise of intellectual comprehension (Lat. cum-prehendo, "I take together") of the phenomenon. The transliteration of the hieroglyphs presented

below is to be read from the left as follows: dˁr ḫr k wbnw.f / wd ḫr k ˁ k tp.f / gmm.k dnn.t.f wdȝ ti / n wn nt thm pšn sd im.s.

The verb "palpate", meaning to perform an examination with the fingers (dˁr), is, in turn, a modality of examining (ḫˁ.t), which is also used as a synonym for the same term. At this juncture, the Egyptian surgeons occupied a position at the intersection of medicine and the scientific pursuit of the divine. They were perpetually oscillating between meticulous observation and the intervention of the goddess Sekhmet, the lioness, a goddess who is associated with war, destruction, plague and healing. She is frequently depicted with the head of a lioness and a sun disk on her crown. This dynamic equilibrium between the practice and the supernatural intervention was a characteristic feature of medicine in ancient Egypt and a typical way of formulating a diagnostic hypothesis. This double-faceted passage was considered a pivotal phase in analysing the injury, setting the stage for resolving the case. Finally, a conclusion ir reached by the text: “An ailment that I will cure." (smr iry)

It should be noted that the prognosis is not referenced; that is to say, the author makes no mention of what was likely to happen to the injured person's medical condition. Evidently, the physician made a concerted effort to observe the data without preconceived notions, meticulously documenting all potential hypotheses before conducting a thorough examination of the patient's condition. This examination involved visual and manual inspection, in accordance with the methods outlined in the Edwin Smith Papyrus. The formula ḫ.k.s – meaning 'if one were to examine it' – marks the beginning of each case in the Edwin Smith Papyrus, preceding the gmm.k formula – meaning 'you should find' – depicted as a glossy ibis pecking the ground, and the dd.in.k formula – meaning 'you should say'. This utterance marks the initiation of the diagnostic process. The snake and the hand can be interpreted as representing the verb 'to say', while the other sign, a leaf, followed by the movement of water and a cup, indicates the preposition 'by', followed by the second-person masculine pronoun 'you'. A precise and logical sequence of consequences is evident in the analysis, a notion accentuated by the use of language. This sequence facilitates the acquisition of knowledge (sšmt) through the medium of 'instructions' (šsˁw), which are theoretical in nature. Obenga posits that this phase, otherwise referred to as the 'examination of the proof', is of significant relevance in exploring the logical texture of the pre-classical scientific method. “(…) seshemet, seshmet (…) This is the review of the whole body of evidence or premises and rules that determine the validity of a solution. Such an examination of a logical proof always leads to a further conceptual generalization. Thus, the ancient Egyptians had the technique of forming concepts inductively [11].

This involves evaluating the entire body of evidence or principles that determine the validity of a solution. Examining a logical proof invariably results in the formulation of a further conceptual generalisation. Clearly, the ancient Egyptians were adept at using an inductive approach to form concepts. At this point in the paper, a question arises: Were medical treatises applied in everyday therapeutic practice in ancient Egypt? The answer is affirmative. A vivid example of this can be seen in the tomb of Vizier Weshptah, also known as Izi. The high official probably died of a cerebral haemorrhage while at the construction site of Pharaoh Neferikara Kakai's tomb. According to the inscriptions, the Fifth Dynasty pharaoh was walking through the rooms of his funerary temple — probably the pyramid of Abusir — with his sons, preceded by Weshptah, who was leading the way. Suddenly, the man collapsed. The pharaoh immediately ordered that he be helped, amid the general concern of the entire court. Weshptah was taken to the palace, where the chests containing the medical papyri (rdi.in.ḥm.f itt n.f 3'w n sš) were opened at the king's request. This is exceptional, as Brestead noted, because it testifies to the existence of medical treatises since the Old Kingdom (3000–2500 BC). Here is the outcome of the visit: r 3mmw in… dd.sn ḫr ḥm.f wnt.f db3ḫ.f“(towards) about spasms. They told His Majesty that he was unconscious.”

A pre-classical idea of intention

The relationship between the three phases of the medical examination – seeing, understanding, doing – so peculiar to the ancient Egyptian thought, brings us back to the verb iri, to do/act, graphically rendered by the sign of the eye, to indicate the connection between cognitive and operational activity. This passage is crucial in order to explore the method with which Egyptians dealt with reality, as the proto surgery seems to prove. The Egyptians employed the stylised eye to establish a correlation between action and the mind, thereby introducing a theoretical-contemplative dimension into the quotidian. It is evident that human activities such as the fabrication of objects or the performance of procreation, which is the highest form of human existence, are not exclusively physical endeavours. Indeed, for the Egyptians, all activities were conceptualised as originating from the faculty of sight. The act of seeing can be defined as the process of comprehending something that is both enduring and equitable, and which delves into the fundamental essence of a subject, almost establishing a dialogical relationship. The verb

denoting vision – written here as m33 – is once again accompanied by the eye, thus functioning as a determinative. The sign is not read, but it facilitates the appropriate comprehension of the term. It is noteworthy that, prior to the Hellenic philosophers, the Egyptians had already established a correlation between action and the intellect, a concept that finds expression in the eye as the intellectual organ of orientation and perception of reality. In the third century BC, Anaxagoras proposed a correlation between the hand (i.e. action/ability) and the intellect, positing that "Man is the most intelligent of living beings because he has hands". This notion was subsequently inverted by Aristotle, who argued that "(Man) has hands because he is the most intelligent".

This observation alone is enough to compel us to take the theoretical awareness of the ancient Egyptians seriously. Although they did not originate philosophy, they displayed a unique intellectual inclination. Compared with Anaxagoras's theory, there appears to be an additional element to consider when using the eye to express the concept of action. It could be argued that the ancient Egyptians had an intuitive understanding of the relationship between intention and action. In other words, they recognised that in order to perform an act, the actor must be knowledgeable of the sequence of steps that lead to the desired outcome. They must conceptualise this both mentally and operationally, as Thomas Aquinas demonstrated in the medieval era with regard to the 'formal cause of action'. It is important to note the link between this Egyptian conceptual frame and the idea of intention, as theorised by Anscombe in [12]. Intention is a crucial component of the will. This is not merely an act of bringing about a certain state of affairs, but rather a complex volition that enables the achievement of a goal. As Anscombe wrote in Proposition 8, an intention belongs to the class of 'non-observational knowledge', i.e. the “class of movements known without observation.” When I say: “I open a window”, the intentionality of my act is derived from my comprehensive understanding of the passages that facilitate the opening of that particular window. In other words, the intention invariably presupposes the awareness of the means by which the objective (in this case, the opening of a window) can be accomplished. The concept of sensing, in its grasping reality, for allowing will to consent, plays a pivotal role in defining the means. The Egyptians had a clear insight into the fact that every intentional knowledge melts together thought and manipulation, the theoretical and the practical environment, the eye and the hands [13-17].

Conclusion

While operating in a domain significantly divergent from contemporary scientific principles, the medical / surgical practitioners of ancient Egypt demonstrated a noteworthy propensity for phenomenological analysis. Their methodology, while not aligned with contemporary scientific standards, exhibited a fundamental adherence to the principles of observation, analysis and conclusion, eschewing preconceived notions in favour of a focus on the fundamental aspects of the case treated. Despite the fact that the text taken in consideration in this paper does not make reference to the term 'method', it is evident that 'šsˁ.w', which can be translated as 'instructions', belongs to the semantic domain of critical accuracy.

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