

Ancient Greek Terminology in Hepatopancreatobiliary Anatomy and Surgery

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ABSTRACT: Most of the terminology in medicine originates from Greek or Latin, revealing the impact of the ancient Greeks on modern medicine. However, the literature on the etymology of Greek words used routinely in medical practice is sparse. We provide a short guide to the etymology and meaning of Greek words currently used in the field of hepatopancreatobiliary (HPB) anatomy and surgery. Focusing on HPB medical literature, the etymology and origin of Greek words including suffixes and prefixes are shown and analyzed. For example, anatomy (*anatomia*) is a Greek word derived from the prefix *ana-* (on, upon) and the suffix *-tomy* from the verb *temno* meaning to cut. Surgery, however, is not a Greek word. The corresponding Greek word is *chirurgiki* derived from *cheir* (hand) and *ergon* (action, work) meaning the action made by hands. Understanding the root of Greek terminology leads to an accurate, precise and comprehensive scientific medical language, reflecting the need for a universal medical language as a standardized means of communication within the health care sector.

IMAJ 2015; 17: 467–469

KEY WORDS: Greek terminology, hepatopancreatobiliary, etymology, antiquity

The contribution of the Greek language to medicine is well known. In medical science today more than 90% of the terms are of Greek, Latin or Greco-Latin origin. Greek is one of the world's oldest recorded languages, spoken and written for almost 3000 years [1]. Many words and medical terms have been transferred from Greek to English, with or without modification and with their pronunciation preserved [2].

In ancient Greek mythology and religion, Asclepius is the god of medicine whose healing temples were located throughout Greece. The Greek physician Hippocrates (fifth century BC), considered the father of modern medicine, laid the foundation for a rational approach to medicine and established the principles of surgery [3].

We believe that understanding the linguistic roots and meaning of medical terminology used in hepatopancreatobiliary (HPB) surgery contributes to accuracy in perform-

ing and comprehending this surgical specialty [4,5]. In this article we provide a brief guide to the Greek words used in the field of HPB anatomy and surgery.

WORD FORMATION

Some words and medical terms have been transferred from Greek to English with or without modification, such as pancreas, *hepar*, spleen, stomach and trauma. In addition, the Greek language permits the formation of composite words. Many complex medical terms consist of a combination of roots and affixes of Greek origin that represent the special meaning and creativity of the language [6]. Such suffixes and prefixes with their etymology are shown in Tables 1 and 2 respectively. For example, Greek

Table 1. Surgical suffixes

English/Latin version	Greek derivation	Examples
-tomy	<i>Temno</i> (to cut)	Choledochotomy
-ectomy	<i>Ektemno</i> (to cut out)	Hepatectomy
-scopy	<i>Scopo</i> (to observe)	Laparoscopy
-stomy	<i>Stomia</i> (orifice) <i>stoma</i> (mouth)	Pancreaticojejunostomy
-graphy	<i>Graphein</i> (to record)	Cholangiography

Table 2. General prefixes

English/Latin version	Meaning	Example
<i>A-</i> or <i>an-</i>	Negative, opposite	Atresia [<i>a-</i> + <i>tresis</i> (hole)]
<i>En-</i> or <i>em-</i>	In, into	Empyema
<i>Ex-</i>	Out of, away from	Excision
<i>Hyper-</i>	Beyond normal, extreme	Hypertrophy
<i>Hypo-</i>	Under, below	Hypovolemia
<i>Peri-</i>	Around	Peripancreatic
<i>Epi-</i>	Upon, after, in addition	Epicholedochal
<i>Hemi-</i>	Half	Hemihepatectomy
<i>Dys-</i>	Bad, improper	Dysplasia
<i>Syn-</i>	With, together	Synchronous [<i>syn-</i> + <i>chronos</i> (time)]
<i>Met-</i>	After, beyond	Metastasis
<i>Dia-</i>	Trans, through	Diathermia [<i>dia-</i> + <i>thermi</i> (heat)]
<i>Para-</i>	Beside, next to, reverse	Paraduodenal

hyper- (Latin analogue *super-*) gave origin to many words such as hypertension and hypertrophy [7].

LIVER

The Greek word *hepar* is not used as an isolated term in English and has been replaced by the Latin term *liver*. The *hepar* [*he* (where)- *pathos* (passion)] was regarded in ancient Greece as the center of passions, which included courage, anger and fear. The ancient association of liver with courage and anger appears in other languages as well. Thus, in Italian and Spanish, the expression “has liver” (*avere fegato* and *tener higato*, respectively) describes a courageous man. Similarly, the French expression *avoir les blancs foies* (has white liver) characterizes the coward and the faint-hearted.

The word *hepar* gives origin to many derivatives and is widely used in the synthesis of terms that refer to the organ, such as hepatic vessel, hepatic enzymes, hepatitis (*-itis* denotes inflammation), hepatocellular carcinoma, hepatomegaly (*hepar* and *megas*), hepatectomy (*hepar* and *-ectomy*). The term *pyleo* means portal and derives from the word *pyli* which means entrance or gate. The term *pyleophlebitis* is derived from *pyleo*, *phleba* (vein) and the suffix *-itis* (meaning inflammation). Artery derives from *aer* (air) and *tiro* (to keep), meaning the presence of air in the lumen. The arteries were thought to contain air since they were found to be empty during the dissection of cadavers, in contrast to the veins that contained blood. Ligation of the arterial supply of the organ can cause ischemia, which is a combined Greek term from *ischo* (to restrict) and *hema* (blood).

The Homeric word *lovos* (used in the epic poems “The Iliad” and “The Odyssey”, ninth century BC) was transferred to modern Greek without modification and gave origin to the English medical term *lobe* that describes the anatomic division and extension at the gross anatomy level [8]. The term *cirrhosis* is a medical term that was transferred from Greek to English without any modification. It derives from the word *kirros-* (*kitrinos*) meaning yellow (jaundice) and the suffix *-osis* denoting a state or a process. Ascites, the condition of fluid collection within the abdominal cavity, comes from the word *askos* (bag), depicting the bag-like shape of an abdomen. The combined term *enterohepatic circle* comes from *entero* (intestine) and *hepar* (liver).

In addition to the contribution of the Greek language to liver terminology, Greek mythology also reflects our understanding of the physiology of this unique organ. Liver regeneration was first described by the ancient Greeks in the story of Prometheus, who stole the fire from the Gods on Mount Olympus for the benefit of humanity. Prometheus, in eternal punishment, was chained to a rock and his liver was eaten every day by an eagle but was regenerated by night. Years later, the Greek hero Hercules slew the eagle and freed Prometheus from his chains.

BILIARY TRACT

The prefix *chol(e)* derives from the Greek *choli* meaning the bile. In modern medicine, many words are derived directly from the word bile (bile duct, biloma, bilious ascites, hemobilia), despite the fact that the prefix *chol(e)* contributes to the formation of the major part of the terminology referring to the biliary tract, e.g., cholecystitis (*chole*, *cyst* and *-itis*), cholangitis [*chole*, *angio* (vessel) and *-itis*], choledochus [*chole*, *docheion* (pot, container)] cholelithiasis [*chole*, *lithos* (stone) and the *-asis* (suffix of action)], choledocholithiasis and choledochotomy [9]. The term choledochocoele derives from choledochous and *cele* (hernia) denoting the protrusion of a focally dilated, intramural segment of the distal common bile duct into the duodenum. The term empyema of the gallbladder comes from the prefix *en-* (or *-em*) (in, into) and the term *pyon* (pus) meaning the presence of pus in the gallbladder [10].

The term *chol(e)* also gave origin to the word melancholy (*melancholia*) used in psychiatry to refer to a mood disorder of non-specific depression. According to the ancient Hippocratic belief, there are four humors (blood, yellow bile, black bile, phlegm) in the human body and their balance is necessary for maintaining a state of health. Excess of black bile would cause melancholy [*melas* (dark, black) and *chole*]. The literal meaning of the hormone cholecystokinin is *chol(e)-cyst-kinin* (move), denoting the stimulation of the gallbladder to contract. Cholestasis derives from *chole* and *stasis* (standing still), meaning the condition in which bile cannot flow from the liver to the duodenum.

PANCREAS

The pancreas derives from the prefix *pan-* (all) and *kreas*, which means flesh, reflecting the notion of the homogeneous substance and fleshy consistency of the organ [9]. This is a Greek word that was transferred from Greek to Latin and from Latin to English without modification. The pancreas gives origin to several terms that concern the anatomy, physiology, embryology and clinical aspects of the organ (diagnostics, surgery, pathology).

To describe the anatomy [*ana-* and *temnein* (to cut)] of the pancreas many Greek words are brought to mind, such as epigastrium [*epi-* (above) and *gaster* (stomach)], hypochondrium [*hypo-* (under) and *chondros* (cartilage)], ectopic (ec- from *exo*, meaning out and *-topos*, place, i.e., something not in the place it should be), sphincter [from the Greek verb *sfigo* (tighten)], mesenteric artery [*meso-* (in the middle) and *-entero* (bowel)]. The term diaphragm is derived from the prefix *dia-* and the noun *phragma* (barrier, fence) meaning a membrane separating the thorax from the abdomen [9].

As already mentioned, inflammation of the pancreas is called pancreatitis (pancreas and *-itis*). Necrotizing pancreatitis derives from the Greek verb *nekrono* (to mortify) and means the diffuse or patchy necrosis (deadness) of the pancreatic paren-

chyma. The term pseudocyst is derived from the prefix *pseudo*, meaning false and cyst [*kysti* (bladder)]. In modern medical literature, endoscopic [*endo-* (inside) and *scopo* (to observe)] retrograde cholangiopancreatography (ERCP) describes an interventional procedure of imaging of the cholangio- and pancreas where -graphy (*graphein*) means to depict or to delineate.

The physiology of the organ, derived from the Greek words *phusis* (nature) and *logy* (to speak, to give an account), borrows Greek terms such as endocrine [*endo-* (inside) and *-crine*, from *ekrisis* (discharge)], exocrine (*exo-*, out), system and hormones [from the Greek verb *ormo* (bolt)]. The term parenchyma, same in Greek, derives from the verb *parenkhein* (to pour in) where the alpha, beta, gamma and delta cells are the first four letters of the Greek alphabet. The term glucose comes from the Greek word *gleukos* meaning sweet wine, and the hormone glucagon derives from *gluco-* and *geno* meaning to give birth. A few more examples are somatostatin [*soma* (body) and *stasis* (stop)], pancreatic polypeptide [*poly-* (many) and peptide, *peptidio* (protein ingredient), which is a Greek word], and enzymes [(*en-* and *zyme*) (ferment and leavened) to describe a process].

ONCOLOGY

The study of tumors, called oncology, comes from the root *ongos*, which means tumor and the suffix *-logy* (to speak or to give an account). Neoplasm is also of Greek origin from the adjective *neos* (new) and *plasma* (anything formed or molded), meaning something newly formed. Carcinoma is a term used for malignant tumors. It derives from the word *karkinos* that Hippocrates first used to describe breast cancer due to its shape which resembles a crab.

Most of the neoplasms in HPB oncology have names of Greek origin. All have the same noun-forming suffix *-oma*. Adenocarcinoma is derived from the noun *adenas* (gland) and the aforementioned *karkinos*. Hemangioma comes from *hema* (blood) and *angeion* (vessel). Hepatocellular carcinoma is the carcinoma that derives primarily from the hepatocytes [*hepar* and *cyte* (cell)]. The term neuroendocrine tumor has taken its name from *nevro* (nerve) the prefix *endo-* (intra-) and the noun *ekrisis* (discharge). More examples are cystadenoma [*kysti* (cyst) + *adenoma*] and cystadenocarcinoma, cholangiocarcinoma, solid pseudopapillary [*pseudos* (lying, false)] tumor and mesenchymal hamartoma from the Greek word *hamartia* which means foul or sin and in medicine is used to reveal a bodily defect. The suffix *-blastoma* used in pediatric oncology derives from the term *blastos* (bud). Examples are hepatoblastoma and pancreatoblastoma. Metastasis is a term that was transferred from Greek without modification deriving from the prefix *meta-* (after, beyond) and the noun *stasis* (stand) meaning a new distal location.

DISCUSSION

A universal medical language remains a diachronic issue that facilitates international exchange of scientific information. Most of the medical terms that we are familiar with are derived from Greek. It is still prevalent among doctors that when we need a new compound word we turn to Greek terminology. On the other hand, it is claimed that many Greek words tell us nothing that is not expressed in an English equivalent understood by all who speak English [11]. Is it a matter of Hellenomania or Hellenophobia? Is it “all Greek” to the medical community?

The Greek language gave origin to the basic anatomic, physiological, biological and surgical terms in current use. In addition, complex words, derivatives and combinations of Greek terms cover the field of medicine in general. Understanding the root, suffixes and affixes of Greek terminology leads to an accurate and comprehensive scientific medical language where the word is self-explanatory, reflecting its own eternal semantic.

It is clear that the field of hepatopancreatobiliary anatomy and surgery encompasses Greek terminology. Several medical terms are derived from the organs’ appearance, consistency, size, content or origin. Analyzing the etymology and meaning of these words will facilitate our daily practice and enable us to perform more efficiently for the patient’s benefit.

Authors’ note

This article attempts to explain the ancient Greek terms used in HPB anatomy and surgery in daily practice. Providing a full explanation of Greek medical terminology is beyond the scope of a medical article.

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“What’s done to children, they will do to society”

Karl A. Menninger (1893-1990), American psychiatrist