METAPHORS IN BIOMEDICAL ARTICLES

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Abstract: As rigid as the language of science, in general, and that of medicine, in particular, may seem, it is not void of metaphors. Metaphorical phrases have a distinct role in the style, the narrative, and in the language of medicine. Their presence stems from the fact that not only human thinking, but also our conceptual system is fundamentally metaphorical in nature. This paper is a research into a corpus of biomedical articles, and aims to emphasise the role of such a linguistic feature in communicating scientific knowledge.

Keywords: corpus-based research, biomedical articles, metaphors, scientific communication.

In order to communicate new knowledge in any field of human experience, whether scientific or technological, language needs structures which can express new conceptual categories (Štambuk 1998: 373). If a new word was created for every new scientific concept, language would become by far too complex and difficult. Therefore, new concepts are often described by structures which already exist in language. According to Aristotle, "strange words simply puzzle us; ordinary words convey only what we know already; it is from metaphor that we can best get hold of something fresh" (Aristotle 2004: 135).

Expressing new concepts through a metaphorical use of language helps people understand one type of experience by means of another. Metaphors are more than rhetorical flourishes of the language and for physicians they can be devices for helping patients understand complex biologic processes (Reisfield & Wilson 2004: 4024). If we regard science as the reading of the book of nature (Sarukkai 2001: 647), using metaphorical language becomes a natural way of expression.

In Lakoff and Johnson's view, "metaphor is pervasive in everyday life, not just in language but in thought and action" (1980: 3). Robert Frost hypothesised that "all thinking, except mathematical thinking, is metaphorical" (Wolosky 2003: 104). It is also the case of medical language whose style, narrative is metaphorical (Maier & Shibles 2011: 1).

Metaphors were needed in medical language in order to transpose new discoveries by existing means of expression. As such, probably the oldest metaphor still in use today is *blood circulation* introduced by William Harvey in 1628, who explained that blood flowed in a circle within the human body (van Rijn-van Tongeren 1997: 14).

There have been several categorisations of medical metaphors, one of the most notable ones being Salager-Meyer's (1990: 149) who divided them into two broad categories: morphological and physiological. A variety of conceptual areas are used in the formation of morphological metaphors: architectural, geomorphical, phytomorphical, anatomical or zoomorphical, while physiological metaphors refer to processes, functions, and relations.

The present study investigates ten medical articles authored by British or American researchers in the field of orthopaedics in order to identify metaphorical use of scientific language. These appeared in *International Orthopaedics* volumes 37 and 38, the official

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journal of the International Society of Orthopaedic Surgery and Traumatology, published by Springer. The articles, listed alphabetically according to their titles, are:

1. Bovine xenograft locking Puddu plate versus tricalcium phosphate spacer non-locking Puddu plate in opening-wedge high tibial osteotomy: a prospective double-cohort study
2. Effect of parathyroid hormone-related protein in an in vitro hypertrophy model for mesenchymal stem cell chondrogenesis
3. Feasibility and safety of performing outpatient unicompartmental knee arthroplasty
4. Hoffa's fat pad tumours: What do we know about them?
5. Inappropriate requests for magnetic resonance scans of the shoulder
6. Is hybrid imaging (SPECT/CT) a useful adjunct in the management of suspected facet joints arthropathy?
7. Microfractures at the rotator cuff footprint: a randomised controlled study
8. Musculoskeletal tumors and tumor-like conditions: common and avoidable pitfalls at imaging in patients with known or suspected cancer
9. Musculoskeletal tumours and tumour-like conditions: common and avoidable pitfalls at imaging in patients with known or suspected cancer
10. The gait of patients with one resurfacing and one replacement hip: a single blinded controlled study

Manual processing of the articles rendered a number of metaphors which can be categorised from different points of view. However, taking further the aforementioned division of Salager-Meyer, I decided to group the metaphors encountered in the articles under the following six headings: anatomical terms, processes, objects/ tools/ areas, people/ institutions, appearance, and verb phrases. The identified metaphorical expressions are listed alphabetically in Table 1.

Describing all the metaphors that the research revealed would be beyond the scope of this paper, thus only some in each group will be discussed.

To start, let us take the case of *chest wall*. Just as the walls of a chamber protect what is inside, so does the *chest wall* protect some of the vital organs of the body. Also called *thoracic wall*, *chest wall* is one of the oldest metaphors, and it denotes a complex system that provides rigid protection to the vital organs such as the heart, lungs, and liver, stability to arm and shoulder movement, and flexibility to aid in the functional process of respiration. The same rigidity that a brick wall, or any other material for that matter, has is depicted metaphorically as belonging to the chest.

The *rotator cuff* is defined as *a supporting and strengthening structure of the shoulder joint that is made up of part of its capsule blended with tendons of the subscapularis, infraspinatus, supraspinatus, and teres minor muscles as they pass to the capsule or across it to insert on the humerus – called also musculotendinous cuff*[1]. *Cuff*, referring to a circular band, has its meaning associated with the function of the anatomical area that *rotator cuff* denotes.

The idea of wrapping and circularity can also be expressed by *girdle*. Metaphors containing the word girdle include: *pelvic girdle*, *shoulder girdle*, or *pectoral girdle*. The

[1] http://www.merriam-webster.com/medical/rotator%20cuff

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shoulder girdle is the bony structure that surrounds the shoulder area, and the *pelvic girdle* is the bony structure surrounding the hips, which are collectively called *limb girdle*.

The Middle French origin *plateau* describes a land area with a relatively level surface raised above adjacent land. The tibia, one of the strongest and largest bones in the human body, is a long bone composed of a diaphysis, the midsection which is also called shaft, and two epiphyses, namely the rounded extremities of the bone. However, its proximal end, which is part of the knee joint, has a flattened area which is similar to a plateau, thus the metaphor *tibial plateau*.

Erosion is the gradual destruction of something by natural forces (water, wind, ice). While it is mainly connected with soil or rock erosion, the analogy of the hardness of bone led to the metaphor *bony erosion*. According to Schett & Gravallese (2012: 656), *bone erosion* is a central feature of rheumatoid arthritis and is associated with disease severity and poor functional outcome. Erosion is the result of excessive local bone resorption and inadequate bone formation, just as in nature different forces shape, model, and alter the look of landscapes.

Debridement is defined as *surgical removal of lacerated, devitalised, or contaminated tissue*[2] and is derived from the term *debris* which denotes the remains of something broken down or destroyed. In orthopaedic terminology, *debridement* mainly refers to the removal of bone fragments resulting from bone destruction.

The metaphorical *humeral head migration* can be simply explained by the fact that the proximal end of the humerus, the bone in the upper arm, becomes dislocated because the muscles and ligaments which hold it in place become torn, in other words, the head of the humerus changes its position because of the lack of sufficient fixation. The common English word *migration*, on the other hand, has a scientific counterpart, namely *luxation*, to denote, in our case, the situation in which the head of the humerus is not completely in the centre of the glenoid cavity.

Anatomical terms	**Processes**	**Objects/ tools/ areas**	**People/ institutions**	**Appearance**	**Verb phrases**
chest wall	antigen retrieval	blinded study	healthcare watchdog	beach chair position	cells mature
fibular head	bony erosion	bone/ soft tissue windows	normal subjects	feathery appearance	interrogate the database
giant cells	circumscribed ossification	ceiling effects		tail-like extensions/ configurations	mimic malignancy
hyperechoic mass	debridement	culture conditions			pellets were digested/ harvested
limb girdle	fatty maturation	discharge milestones			recovery was uneventful

[2] http://www.merriam-webster.com/medical/debridement

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rotator cuff	humeral head migration	flow chart			simulate tumour
tibial plateau	implantation	gold standard			subjects were pain free
stem cell	incubation	hinged knee brace			undergo biopsy/ surgical resection/ therapy/ hypertrophy/ maturation/ chondrogenesis/ apoptosis
	recovery pathways	lateral bridge			
		mainstay of investigation			
		surgical log			
		threshold			
		tibial cortex hinge			

Table 4. Metaphors encountered in the articles

A frequently encountered metaphorical expression is *implant*, with its derivate *implantation* to illustrate the process of placing (something) in a person's body by means of surgery, in other words, planting securely. Etymologically, the word has its root in the late Middle English: from late Latin *implantare*, meaning *engraft*, which in turn was derived from the Latin *in-* (*into*) and the root *-plantare* (*to plant*). The term *implantation* encountered in the corpus of articles included in this study refers to the process of insertion. *Implant* acts both as a verb and as a noun.

While it can be understood by any lay reader, the case of *ceiling effect* is rather peculiar. *Ceiling effect* may refer to the level at which an independent variable no longer has an effect on a dependent variable or to the level above which variance in an independent variable is no longer measured or estimated. In other words, the metaphor expresses the highest level that can be reached, namely the ceiling. It has the antonym of *floor effect* to denote very little variance, that is, the lowest level, the floor.

Gold standard is a term borrowed from economic sciences referring to a monetary system in which the standard economic unit of account is based on a fixed quantity of gold. In medicine, *gold standard* means diagnosing a disease process, or the criteria by which scientific evidence is evaluated, while in statistics it may refer to the best available test under certain conditions. However, its ambiguity stems from the fact that in economics the meaning of *gold* is that of a *possible standard* and it does not imply *best*, and as such, meaning should be deduced from the context in which it appears. One of the two contexts in which I encountered *gold standard* is "magnetic resonance imaging (MRI) has been the gold standard for spinal imaging". What is interesting about the use of the phrase, however, is the fact that one of the two articles places it between quotation marks.

With *log* referring to the full nautical record of a ship's voyage, a *surgical log* will denote a record of a surgeon's surgical experience. Most surgeons have their own method by

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which they accomplish this often tedious task (notecards, notebook, record sheets, etc.) but due to the availability of computers in our everyday life, such logs are now digital and stored on computers, with different computer software which facilitates both the input as well as the retrieval of data.

One of the most interesting metaphors that I encountered while processing the medical articles is *healthcare watchdog*. This phrase appears in the following context "the National Institute and Clinical Excellence (NICE), the UK's healthcare watchdog" where the particular institute is viewed as a *watchdog* to guard and control. Thus the institute becomes the organisation that makes sure that nothing in the healthcare systems goes wrong.

The metaphorical *beach chair position* literally means that the patient is positioned as if lying on a beach chair, more precisely the patient is initially placed in the supine position and the buttocks and greater trochanter are placed at the main break in the operating table. Such a position has numerous advantages because no additional equipment is required, a standard operating room table can easily be adjusted to the beach chair position. As far as the surgeon is concerned, (s)he has excellent visualisation of the anterior, inferior, and superior glenohumeral structures as well as the subacromial space and it is also the best position for arthroplasty cases.

As far as the metaphorical verb phrases encountered in the articles, I will chose to describe *interrogate the database*, *mimic malignancy*, *simulate tumour*, and some of the phrases using the verb *undergo*.

The verb *interrogate* means to question formally and systematically and to give or send out a signal in order to trigger an appropriate response. The same meaning is conveyed by the metaphorical *interrogate the database*, which is most frequently rendered by phrases such as *search*, *investigate*, or *retrieve from the files/ database/ records* of a department in order to identify cases to be included in a particular research.

Appearing in the same article, both *mimic malignancy* and *simulate tumour* have somewhat similar meanings. The verbs *mimic* and *simulate* express the idea of copying and imitating behaviour, appearance, or effect with the intent of deceiving. In medical terminology the two verbs will mean producing a similar effect, and producing a symptomatic resemblance, respectively. The sense that is transmitted by two metaphors is that of resemblance of benign conditions to some type of tumour.

The verb *undergo* with the subject *cells* appears in the same article accompanied by the objects *chondrogenesis*, *apoptosis*, and *hypertrophy*. Basically, the verb means *endure* or *go through*. In the metaphorical phrases the cells are subjected to cartilage formation, self-destruction of cells, and excessive development, respectively. Furthermore, the same article mentions the fact that *chondrocytes undergo maturation* which will simply mean that cells become mature.

Obviously, the meaning of the great majority of the metaphorical phrases that the present research identified in the ten articles in the field of orthopaedics can easily be implied and understood in context. What this article aimed to emphasise is the fact that metaphors are pervasive in both the thought and discourse of physicians and researchers because such linguistic tools facilitate communication and may even give coherence to the distinctive events of illness (Reisfield & Wilson 2004: 4026). They are used in medical language in order

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to communicate meaning in the best possible way. Thus, by describing unknown knowledge by means of the known, communication is greatly facilitated (Štambuk 1998: 378).

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