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Uses of the Word “Macula” in Written English, 1400-Present

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Abstract

We compiled uses of the word “macula” in written English by searching multiple databases, including the Early English Books Online Text Creation Partnership, America’s Historical Newspapers, the Gale Cengage Collections, and others. “Macula” has been used: as a non-medical “spot” or “stain”, literal or figurative, including in astronomy and in Shakespeare; as a medical skin lesion, occasionally with a following descriptive adjective, such as a color (macula alba); as a corneal lesion, including the earliest identified use in English, circa 1400; and to describe the center of the retina. Francesco Buzzi described a yellow color in the posterior pole (“retina tinta di un color giallo”) in 1782, but did not use the word “macula”. “Macula lutea” was published by Samuel Thomas von Sömmerring by 1799, and subsequently used in 1818 by James Wardrop, which appears to be the first known use in English. The Google n-gram database shows a marked increase in the frequencies of both “macula” and “macula lutea” following the introduction of the ophthalmoscope in 1850. “Macula” has been used in multiple contexts in written English. Modern databases provide powerful tools to explore historical uses of this word, which may be underappreciated by contemporary ophthalmologists.

Keywords

Macula; Macula lutea; Ophthalmic history; Cornea; Retina; Francesco Buzzi; Samuel Thomas von Sömmerring; James Wardrop

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DISCLOSURES

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I. INTRODUCTION

Ophthalmologists generally use the word “macula” to describe the central retina. In this context, “macula” is shortened from the term “macula lutea”, Latin for “yellow spot”. “Macula” is commonly used by ophthalmologists and the lay public, but the word has a rich history that may be underappreciated. Newer databases, encompassing millions of historical documents, provide powerful tools to explore various and changing uses of words through time. We have previously reported on the evolution and impact of various eye and vision terms, although “macula” was not included in this study.¹ Here, we specifically investigate this word and its common uses from about 1400 through the present day.

II. MATERIALS AND METHODS

We searched the word “macula” in multiple databases, including the Early English Books Online Text Creation Partnership, which includes over 40,000 English-language texts during 1475-1700;^A America’s Historical Newspapers, which includes over 1,000 American newspapers from 1690 until the early 20th century;^B the Gale Cengage collections, including the 17th-18th Century Burney Collection Newspapers and the 19th Century British Newspapers; the Oxford English Dictionary; Google Scholar; and the Google n-gram database, which contains the annual frequencies of 1- to 5-word phrases (n-grams), based on approximately 6% of books ever published.²

III. RESULTS

A. Frequencies of “Macula” and “Macula Lutea”

The ophthalmoscope was first presented by Hermann von Helmholtz in 1850.³ The Google n-gram database shows that the term “macula lutea” seldom appeared in English language books prior to that time. The two-word term increased in frequency until about 1880, then became less commonly used in the twentieth century, as it was shortened to simply “macula,” which peaked about 1900 (Figure 1). Similarly, the term “macular degeneration” was not commonly used in English books until a century after the development of the ophthalmoscope, because the condition was initially labelled “choroiditis.” In fact, the frequency of the term “choroiditis” in English books in the latter portion of the nineteenth century was greater than the frequency of the term “macular degeneration” today.¹

The single word “macula” shows a subsequent increase in frequency peaking about 1970, which appears to reflect an increase in the clinical and histological study of the central retina. The word began to represent an ophthalmological subspecialty as well as an anatomic region, as illustrated by the founding of The Macula Society in 1977.

The apparent decline in the frequency of “macula” after about 1970 bears comment. In our previous study, many terms showed similar decreases in frequency during this timeframe, including “amblyopia”, “glaucoma”, “ophthalmologist”, “visual acuity”, and others.¹ We believe this reflects an artifact of the database construction. Most books (especially the older ones) included in the Google corpus were obtained from university libraries, but some (especially the newer ones) were contributed by publishers.² The changing character of the

database over time may introduce a bias against books more typically found in university libraries, including medical and scientific texts.

B. “Macula” as a Non-Medical “Spot”

“Macula” was commonly used to mean “spot” or “stain” or “error”, both literally and figuratively. For example, a 1493 religious text used the common Latin expression “sine macula”, meaning “spotless” or “immaculate”.^C Sir Thomas Eliot’s 1538 dictionary includes the entry “Macula, a spotte, a blemyshe.”^D William Shakespeare’s *Troilus and Cressida* includes the lines “For I will throw my gloue [glove] to death himselfe, / That there is no maculaon [maculation] in thy heart.”^E

One 1773 poem in an American newspaper included: “There are *blockheads & sots*, aye, and MACULAE SPOTS, / As sure as the sun is *above* us: / *Mundungus*, and RHOMBUS, and *rascals* among us, / And SOME who *pretend* that they love us.”^F A 1789 newspaper contained this example: “In a word, however, to cut this matter short, *Tom* resolved to *turn over a new leaf*; for, in his book of life, he trusted there were many new ones, unsullied by the *macula* of vice ...”^G Multiple other examples were found during this time period, including in a political commentary: “He has been duly invested with the regular insignia, after undergoing a thorough catechism – the dark maculae of his federalism have been carefully whitewashed ...”^H This non-medical usage continued in US newspapers as recently as 1919: “Oh Macula that painted to my pure heart ...”^I

The relationship between the words “mackerel” and “macula” is of interest. Some species of mackerel, such as the Atlantic Spanish mackerel (*Scomberomorus maculatus*), have prominent spots. A 1919 newspaper article published in at least five states wrote: “... the sole is so called from its resemblance to the flat of the foot ... and the mackerel the spotted fish (macula, a spot).”^{J-N} The *Oxford English Dictionary (OED)* disputes this explanation, however, citing a secondary English usage of “mackerel” meaning “procurer” or “pimp”, and derived from the Old French word “makerele”, as the mackerel was once thought to assist in the reproductive activities of the herring.^O Either way, the (mis)conception of “mackerel” as “spotted fish” suggests that the average US newspaper reader 100 years ago was familiar with the word “macula” as a “spot”.

The word was also commonly used in astronomical contexts. A 1629 religious text included the passage “... whither it be occasioned by the macula’s or spots in the Moone ...”^P Robert Hooke discussed “macula in sole” [sunspot] in 1677.^Q Sunspots were described in British newspapers by 1764^R and in US newspapers by 1766.^S There were multiple subsequent similar uses in US newspapers, as late as 1875.^T

C. “Macula” as a Skin Lesion

“Macula” has also been used extensively in a medical context as a skin lesion. The 1572 dictionary of Richard Huloet listed both non-medical (“bleamishe or spotte”) and medical (“Moole, or freeken in the face. Naeuus.”) definitions.^U One example occurred as late as 1880 in US newspapers.^V

“Macula” was sometimes used in a medical context with an adjective describing its color or some other attribute. For example, John Donne wrote “... there was a Macula alba, a white spot of leprosie, as well as a red ...”^W William Salmon discussed “Macula Materna”, or birthmark.^X Steven Blankaart wrote in his dictionary: “Macula epatica is a Spot of brown ... chiefly seizing upon the Groins, the Breast and back ... Macula Maternalis is a spot with which a Child is born, of brownish Colour ... Macula volaticae is a red or purple Spot here and there in the Skin ...”^Y

D. “Macula” as a Corneal Lesion

The *OED* contains a quotation from approximately 1400, the earliest notation in the entry, using “macula” to mean ocular surface disease, or wen (cyst): “Macula is a wem in a mannys i3e.”^Z A 1655 medical text by Lazare Riviere noted, in a discussion of corneal opacities: “... another is less [severe], and comprehendeth but a little space of the the Pupilla, and then it is properly called Macula, or Pin and Web.”^{AA} Richard Baxter wrote in 1696, “... I fell into a Disease in my Eyes almost incredible; I had near every Day for one Year, and every second Day for another year, a fresh *Macula*, commonly called a *Pearl*, in one Eye, besides very many in the other ...”^{BB} Subsequent examples were noted as late as 1917 in US newspapers.^{CC}

Macular corneal dystrophy was first described by Arthur Groenouw, although he used the term “type II” instead of “macular”.⁴ Max Bücklers first used the term “dystrophia corneae macularis” in a 1938 book, which was reviewed in English by Ernst Waldstein in 1939. In the English language review, Waldstein wrote of macular dystrophy: “The changes are ... of a more diffuse character than in the granular variety and impair the vision much more. Persons affected with macular dystrophy are to be sterilized.”⁵

E. “Macula Lutea”

Francesco Buzzi wrote the first description of a yellow color in the posterior pole (Figure 2) in 1782, although he did not use the word “macula”.⁶ He wrote, “... laterale al nervo ottico ... si vede sempre la medesima retina tinta di un color giallo ... [lateral to the optic nerve ... is always seen the same retinal tint of a yellow color].”⁷ Samuel Thomas von Sömmering is credited with the first use of “macula lutea” for this structure, which he published by 1799.⁸ The 1818 second edition of *Essays on the Morbid Anatomy of the Human Eye* by James Wardrop discussed “macula lutea” and attributed the term to Sömmering: “... there is a peculiar part of its structure called the *Macula Lutea*, discovered by Sömmering, which has hitherto been only observed in the human eye, and the functions of which have not been even conjectured.”⁹ We believe that this book may represent the first known use of the term in this context in an English text. The *OED*^{DD} appears to have missed this book and instead cites an 1844 passage from *Dictionary of Medical Science* by Robley Dunglison: “... the central foramen and yellow spot of the retina; discovered by Sömmering. *Mac’ula lu’tea*.”¹⁰ An 1858 book by Jabez Hogg included both “macula” and “macula lutea”, indicating that the single word “macula” was used in medical texts by this time.¹¹

“Macula lutea” first appeared in a US newspaper in 1853, describing a presentation by Albert von Kölliker and Heinrich Müller: “... the part the most sensible to light, the *macula*

lutea ...”^{EE} We identified other uses of the two-word term “macula lutea” in US newspaper articles or advertisements between 1878 and 1908.^{FF-KK} Gradually, the single word “macula” (rather than “macula lutea”) became more frequent in US newspapers, consistent with the trends from the n-gram database. An 1876 report of the International Congress of Ophthalmology included a mention of “additional observations on the halo around the macula”.^{LL} Other uses of the single word “macula” in a retinal context occurred in US newspaper articles in 1902,^{MM} 1915,^{NN} and 1922.^{OO} A 1915 cartoon (Figure 3) featured a character who reads from a book about vision: “Look here – ‘In the young, deterioration of the macula is rapid – upon the first manifestation of the squint ...’”^{PP}

The definition of the macula evolved during the 1970s, as illustrated by the sequential editions of the influential Gass atlas. The original (1970) edition did not specifically define the size or boundaries of the macula.¹² In 1971 Hogan and colleagues defined the macula lutea as a portion of the central retina: “The central part of the retina is 5 to 6 mm in diameter and contains the macula, the fovea and the foveola. Within the central retina is a zone known as the macula lutea; it measures about 2.0 mm horizontally and 0.88 mm vertically and is slightly yellow in color ... The diameter of the macula lutea, however, is less than half that of the central area of the retina.”¹³ Although Hogan et al. defined the macula as smaller than the central retina, the second (1977) edition of Gass’ atlas defines the macula as equivalent to the central retina: “Anatomically, the macula (macula lutea or central retina) is defined as that portion of the posterior retina that contains xanthophilic pigment and two or more layers of ganglion cells. It measures approximately 5.5 mm in diameter and is centered approximately 4 mm temporal to and 0.8 mm inferior to the center of the optic disc.”¹⁴ The third (1987)¹⁵ and fourth (1997)¹⁶ editions use an essentially identical definition and the fourth edition specifically cites Hogan and colleagues’ work for this definition.

IV. CONCLUSIONS

We have illustrated various uses of the word “macula” in written English, including Wardrop’s 1818 publication that to our knowledge represents the earliest use of the word in this context in an English text identified to date.

Wardrop published Sömmering’s Latin phrase “macula lutea” in 1818,⁹ but “macula” had not yet “become” an English word in this context. The present manuscript cannot precisely establish this date, but the word appears to have become widely accepted by the early twentieth century. The word frequency of “macula” peaks about 1900 on the Google database (Figure 1), and the word begins appearing in publications for general readers at approximately this time, including a 1907 newspaper advertisement for an opticianry practice^{JJ} and a 1915 newspaper cartoon (Figure 3).^{PP}

We searched multiple online databases, but this may not represent an exhaustive search. The Google database comes from books scanned from university libraries, representing about 6% of all books ever published, and may not be truly representative of all books published during that time period. The America’s Historical Newspapers database, which uses Optical Character Recognition (OCR) technology to read microfilm images of newspapers,

contained 3,969 matches for the word “macula” (last accessed November 22, 2013), but many of these were false positives. The Early English Books database, which contains transcribed, encoded electronic editions of early texts, contained 374 records containing “macula” (last accessed November 22, 2013), but this database was generally more accurate. Regardless, it is reasonable to suspect that one or more databases may have missed examples of “macula” (especially the US newspaper database), or that many publications were not included in the databases at all. When we note that, for example, Wardrop was the first to publish “macula” in English, this simply means that this is the earliest citation we found, but it does not disprove the presence of earlier publications missed by our search strategy. As the databases continue to collect additional publications, perhaps additional information may be collected. Nevertheless, we believe we have illustrated some noteworthy and interesting uses of the word “macula”, perhaps increasing the appreciation for this common word.

V. LITERATURE SEARCH

We searched all uses of the word “macula” in the Early English Books Online Text Creation Partnership, which includes over 40,000 English-language texts during 1475-1700;^A America’s Historical Newspapers, which includes over 1,000 American newspapers from 1690 until the early twentieth century;^B and the 17th-18th Century Burney Collection Newspapers and the 19th Century British Newspapers (both from the Gale Cengage Collections). Other resources utilized included the Oxford English Dictionary; Google Scholar; and the Google n-gram database, which contains the annual frequencies of 1- to 5-word phrases (n-grams), based on approximately 6% of books ever published.²

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Figure 1.

Google n-gram showing frequencies of the terms “macula” and “macula lutea” during the timeframe 1800-2000. Note the increase in both terms after the 1850 introduction of the ophthalmoscope.

Word Frequencies of “Macula” and “Macula Lutea” Using the Google English-Language Corpus

Figure 2.
An example of the yellow spot (macula lutea) seen in a postmortem eye. Image courtesy of Myron Yanoff, MD.

SCOOP, THE CUB REPORTER

If the Boss Is—He Won't Admit It

By "Hop"

Figure 3.

Cartoon published in a 1915 newspaper, using the word “macula”, suggesting common understanding of this definition of the word at this time.^{PP} Reproduced with permission from NewsBank, Inc.