Rembrandt's Ocular Pathologies

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Purpose: This article aims to medically and artistically analyze various ophthalmological ailments documented in self-portraits of Rembrandt to determine if those ailments were medical conditions or stylistic and age-related changes.

Methods: A systematic literature review using Pub Med and Google Scholar found 232 results from a search of "Rembrandt" and more than 5,000 results for "Rembrandt Aging." After extensive review of the literature, the authors found 17 relevant sources. These sources were then supplemented with historical books on Rembrandt and the aging processes of artists. Analytical observations with proportional measurements of anthropometrical landmarks (from self-portraits of Rembrandt at various ages) were studied, measured, analyzed, and compared using a standardized technique via MB ruler graphic software to assess age- or medically related changes.

Results: The ophthalmological problems cited in the literature related to Rembrandt's periorbital structures were found by the authors to be false. Signs of inappropriate aging and ailments, such as hyperthyroidism were deemed inaccurate by the authors based on absence of classical disease progression. Ophthalmological problems cited in the literature on Rembrandt's visual acuity were found to be stylistic changes or considered normal aging. Finally, the authors found that ophthalmological problems relating to Rembrandt's eye and orbital adnexa are unfitting because these problems were not seen in subsequent paintings.

Conclusions: The authors believe that all the physical changes seen in Rembrandt's portraits represent natural age-related or stylistic changes, and do not represent signs or symptoms of diseases in the master.

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Physicians have been fascinated by the aberrations in style and anatomy seen in renderings of the great masters. These doctors, using their honed clinical and diagnostic skills, have very carefully studied the works of the great masters and in many cases have diagnosed interesting medical ailments in the artist and subject based on their discoveries. A swelling in the neck could be diagnosed as a thyroid goiter. Nodules in the hand were considered a sign of rheumatism. A faulty perspective in the background assumed a visual problem in the artist. A crooked smile signified facial paralysis. Unfortunately, in many cases, these diagnoses were speculations at best, often based on a single finding seen in a particular work. In addition, many investigators lacked an exposure to a series of work performed by that particular artist or an adequate knowledge of art history and the stylistic changes of a particular period.

One of the artists most favored by these medical sleuths is the renowned Dutch painter Rembrandt van Rijn (1606–1669). He has been the subject of numerous medical papers and has been diagnosed with a myriad of clinical ailments. Perhaps the 2 most compelling reasons for clinicians to favor this master are his realistic style and the prodigious number of self-portraits available for study and comparison. Over one hundred artistic works have been considered possible portraits of the artist. There is a general consensus that 40 of these works are true portraits of the master and that 25 were executed by the artist himself.[1] This plethora of material allows observers to follow the artist as he aged in a "pictorial autobiography."

Little is known about the true medical history of the great artist and certain medical investigators have taken the liberty to diagnose illnesses in the artist based on a number of physical aberrations seen in his portraits and certain stylistic changes in particular periods of his life. The authors noticed an unusually large number of papers dealing with ophthalmological problems of the artist. There have been many papers that have discussed the visual problems of the artist and other researchers have discussed anatomical abnormalities in and around the artist's eyes. In 1999, the London National Gallery published a comprehensive atlas of high-quality reproductions containing all the master's self-portraits. This together with new research and investigations concerning the artist's works, including x-ray analysis, allows the modern medical investigator a new ability to evaluate the veracity of the various diagnoses related to Rembrandt. In this study, the authors perform a medical and artistic analysis of the various ophthalmological ailments supposedly documented in the self-portraits of Rembrandt.

METHODS

A systematic literature review was conducted using both Pub Med and Google Scholar. The authors found 232 results from a search "Rembrandt" on Pub Med and over 5,000 results for "Rembrandt Aging" on Google Scholar. After extensive review of the literature, the authors found 17 relevant sources. Analytical observations with proportional measurements of Rembrandt's paintings were used to determine the presence of suspected pathological findings.

The article is divided into 3 parts. I: Problems related to diseases of the periorbital structures (near the eye). II: Problems related to Rembrandt's visual acuity. III: Problems related to the eye and adnexa but not effecting visual acuity.

The basic premise for diagnosing various diseases through the master's works has been the commonly accepted concept that the artist painted in a realistic style. Therefore, that if some abnormality appeared in a portrait, it can be assumed that such an abnormality is an accurate

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rendering of what the artist saw in his mirror. However, it must be remembered that this is not universally accepted.

Measurement of Rembrandt's right brow descent rate was performed using 8 uncontested self-portraits from age 23 to 63 years. The authors calibrated the brow position using a standardized technique (Nuremberg 1629, Glasgow 1632, Louvre with Bart 1633, London 1640, Karlsruhe 1645, Vienna 1652, Edinburgh 1659, and London 1669) via a graphic software, MB ruler. The authors measured (in pixels) the inter-pupillary distance in each of the portraits and than divided the upper-most position of the right brow with the inter-pupillary distance, creating an individual Brow Index, which is unique and characteristic for each portrait and allowed the authors to compare the brow position change between the different paintings (Fig. 1).[2] These values were then plotted graphically (Fig. 2).[3]

RESULTS

Part I: Periorbital Structures. *Diagnosis Entertained: Dermatochalasis (Excessive Eyelid Skin), Brow Ptosis (Droopy Eyebrows), Crow's Feet, Facial Wrinkles, Accelerated Aging of the Periorbital Area: Periorbital Aging.* **Basis for diagnosis**: At age 53 years, Rembrandt displayed aging changes appropriate for someone much older.

There are a number of changes seen in the self-portraits that are attributable to aging of the periorbital structures and are part of the normal aging process. These include brow ptosis, dermatochalasis (more severe on the left),[1] crow's feet, and facial wrinkles. None of these could be considered pathological nor could they signify a particular disease state other than aging. However, it has been entertained by Espinel, and later supported by Marcus, that Rembrandt suffered from early aging. These authors contend that the changes seen in a work painted at age 53 years are more appropriate for someone 20 or 30 years older.[4,5] Espinel cites a number of modern texts to support his contention and rightly mentioned that his observations were based on findings in the era. As plastic surgeons, dealing with facial rejuvenation on a day-to-day basis, the authors feel that it is impossible to determine the appropriate aging changes for any given decade. The changes cited by Espinel could not be considered unusual for a 53-year-old male in our times, and the authors do not believe that they should be labeled as pathological. In addition, it must be remembered that Rembrandt lived more than 20 years beyond the normal life expectancy of his time and personal hygiene and skin care for men were rudimentary at best.[6] Therefore, it is impossible to know what would be the appropriate periorbital aging changes for someone in Rembrandt's time and the authors conclude that the diagnosis of inappropriate aging is highly speculative.

FIG. 1. The upper most position of the right brow divided by the IPD creates an individual Brow Index, which characterizes each portrait.[2] IPD, inter-pupillary distance.

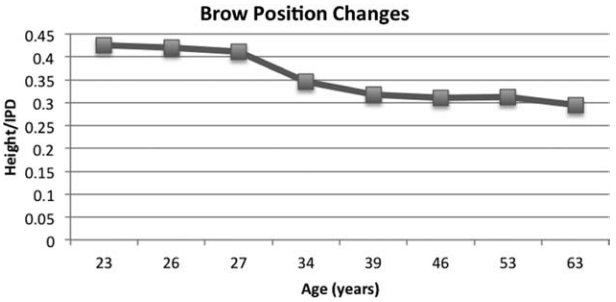

FIG. 2. The Brow Indexes values of the 8 portraits were plotted graphically, demonstrating the natural descent of the brow with aging. This began in Rembrandt's twenties and began to level out in his 5th decade.[3]

Diagnosis Entertained: Asymmetrical Facial Wrinkles and Dermatochalasis of Eyelid Skin. **Basis for diagnosis**: Obvious asymmetry of the wrinkles and furrows about his eyes.

There is a marked glabellar crease on the subject's right side, and a more pronounced lower eyelid crease on the left.[4] These findings cannot be considered pathological, such asymmetrical differences are fairly common today and are not indicative of any underlying pathology or disease state.

Diagnosis Entertained: Brow and Eyelid Ptosis and Compensated Brow Ptosis. **Basis for diagnosis**: Lower position of left eyelid and brow in many works and high-arched brows and marked forehead wrinkles indicating attempt to compensate for obstruction of visual filed.[4]

It is very difficult to evaluate if Rembrandt actually suffered from brow and eyelid ptosis and compensated brow ptosis. There is no question that the master's eyebrows drooped as he aged, but this is a normal phenomenon.

In an attempt to objectively assess the droop of the master's brows, the authors plotted the position of Rembrandt's brows using the brow index and followed their descent over time. This index was developed in the department and the authors use it clinically to preoperatively assess eyebrow position and to follow-up cases of forehead lifts. These values, of brow position changes, were plotted graphically and demonstrated a natural descent of the brow with aging (Fig. 2).[3] This began in Rembrandt's 20's and began to level out in his 5th decade.

At this time, he painted 7 self-portraits over a period of 5 years, 1658–1662 (New York 1658, Black hat 1660, Paris Musee du Louvre 1660, New York, The Metropolitan Museum of Art 1660, Amsterdam, Rijksmuseum 1661 and Cologne, Wallraf-Richartz-Museum 1662) depicting himself with high-arched brows and marked forehead wrinkles. This would seem to indicate that the eyebrow decent had finally obstructed his visual field due to drooping of the brow and lid in front of the pupil. Anyone with such a problem would reflexively pull up their brows by contracting the frontalis muscle of the forehead to remove the obstruction of the eyelid in front of the pupil, causing high-arched brows and marked forehead wrinkles. However, subsequent to these 7 paintings, Rembrandt painted himself without the high-arched brows or forehead wrinkles. Since surgical correction of the problem was not available to the master, there could be 2 answers that could explain why the brows were no longer arched. The first explanation could be that the painter was now blind in the eye that had its visual field obstructed. Since he no longer was seeing out of that eye, he would no longer reflexively make the correction. However, such an affliction would have been quite devastating for an artist and there is no evidence that it indeed occurred. The second explanation is that the artist never actually suffered from visual obstruction at all, and the high-arched bows and forehead wrinkles were simply a stylistic mode adopted by Rembrandt at that

time in his life. It gave the subject a certain unique expression and he elected to use it for that series of portraits, dropping it in subsequent works. It seems to the authors that these later portraits (London, Hug 1669) indicate that Rembrandt's brow ptosis was appropriate for his age and that the apparent compensated brow ptosis was purely stylistic and the artist did not have an obstruction of his visual field.

Diagnosis Entertained: Hypothyroidism. **Basis for diagnosis**: Short eyebrows.

From an early age, the artist consistently depicts himself with short eyebrows. This finding could be of no significance, but short eyebrows are one of the signs of hypothyroidism and several authors have raised the possibility that the painter did indeed suffer from this malady.[7] Marcus and Clarfield[5], however, felt that the artist probably did not have hypothyroidism. Her opinion is based on the fact that replacement therapy did not exist back then. Therefore, untreated hypothyroidism would have had serious implications on Rembrandt's health and it is highly unlikely the artist would have lived as long as he did. In addition, none of his other portraits demonstrate any of the other facial stigmata of the disease, such as puffiness about the eyes, marked loss of hair, or tongue enlargement. Close to Rembrandt's death, the authors do find a general puffiness of the face (Hague 1669) and the authors also note there is a suggestion of swelling in the lower anterior neck in a number of works that could suggest a thyroid goiter but it is an inconsistent finding (Madrid 1642–3, Vienna 1652, Vienna 1655, Florence 1655). In addition, endemic goiter of the thyroid due to iodine deficiency (the most common etiology of goiter) would be very unlikely in someone living near the ocean as did Rembrandt.[8]

Diagnosis Entertained: Temporal Arteritis. **Basis for diagnosis:** Left temporal mass (Washington, 1659).

Espinel raised the possibility that Rembrandt suffered from temporal arteritis, a painful inflammation and swelling of the temporal artery at the temple region, and based that on his study of the Washington self-portrait, 1659.[4] A temporal mass is present only in 3portraits (Washington, Edinburgh, Metropolitan—New York), all executed 1659–1660 (Fig. 3).[9] However, Rembrandt did not demonstrate any of the other clinical signs or complaints related to this disease, such as malaise, anorexia, headaches, weight loss, joint pains, fever, and blindness.[10] In addition, the artist could not avail himself to steroid therapy, which could have cured the mass. Therefore, the mass should have been present in more than these 3 works. Finally, the mass appears on the subject's left side in the Washington portrait and on the right side in the Edinburgh and Metropolitan—New York portraits. The presence of bilateral giant cell formation in temporal arteritis is highly unlikely. Therefore, the authors support the assumption of Zlotnick and Marcus that it is highly unlikely that the artist suffered from temporal arteritis and much more likely that for stylistic reasons the artist illustrated a distended sentinel vein of the temporal region.[5,11,7] Such a sentinel vein would be an inconsistent finding clinically, being visible during a valsalva maneuver or if the subjects face become leaner.

FIG. 3. A prominent blood vessel in the temple. Edinburgh, National Gallery, 1659.[9]

Part Two: Visual Acuity. *Diagnosis Entertained: Presbyopia*. **Basis for diagnosis:** Stylistic change in the master's work as he aged. Coarser, less-detailed brush strokes, portraits showed a larger portion of the subject's body.

Various authors claim that Rembrandt suffered from progressive impairment of his visual acuity as he aged. Their contention is based on 2points. First, visual acuity empirically worsens after the 5th decade[13] and therefore it is logical that Rembrandt also had impairment of his vision. The second is the apparent changes in Rembrandt's style, which these authors attribute to visual impairment. Indeed, this has been subject of contention in the artistic literature for more than 100 years.[14–17] The age-related visual diseases that have been attributed to the master were cataract, macular degradation, glaucoma, unilateral strabismus, presbyopia, and yellow-brown vision.

Presbyopia is the most common cause of age-dependent visual impairment and affects the ability to focus at near distances. It is a ubiquitous problem caused by a gradual change in the crystalline lens, which results in a progressive visual deficiency that starts in the 5th decade. Most people can compensate somewhat in the early stages of the problem but they will usually need refractive lens by the 6th decade to read or draw properly.[18] The possibility that presbyopia was the cause of Rembrandt's change in style as he aged was initially raised in the 19th century.[16] It was noted that as Rembrandt aged, his paintings showed a coarser brush stroke technique. Ravin[16] and Trevor-Roperone[17] support this theory and hypothesize that this stylistic shift, because of visual impairment with aging, was a process exhibited by many painters. Ravin felt the proof for his theory was based on 2 points. First, Rembrandt is never depicted wearing glasses and refractive lens were in fairly common use in the master's time. Ergo, since presbyopia is such a ubiquitous problem the artist must have suffered from uncorrected presbyopia, hence his change in style. Second, Rembrandt was a realistic painter and was not afraid of criticism, so he would not cringe at depicting himself with glasses if he wore them. Hence, the lack of glasses is proof that he did not use glasses while he painted. However, many art historians do not support the presbyopia concept and classify the changes in Rembrandt's technique as a "breadth of style," i.e., the master purposely decided that a certain technique was appropriate at that time of his life and had no relationship to his visual acuity.[19]

The authors tried to determine if there was any way to settle the problem of Rembrandt's spectacles—or lack thereof—by objective analysis of the material available. The authors first looked at the possibility that spectacles that were in use in most of Europe were not common in the Netherlands, thus negating the basis for Ravin and Trevor-Roperone's supposition.[1,4] However, even though paintings from the 15th to 17th centuries rarely show subjects (even older subjects) wearing glasses, Rembrandt painted 3 such portraits and 1 is well known, the "Spectacle Salesman."

There is the possibility that Rembrandt actually wore lenses but removed them when he painted this portion of his face. However, the authors reasoned that if he had worn glasses, the pressure clips that held the spectacles should cause visible depressions at the sides of his nose. No such depressions were noted in any of the portraits. Therefore, the authors must come to the conclusion that there is no objective evidence to determine the veracity of the diagnosis that Rembrandt had corrected,

or uncorrected, presbyopia, which could explain his stylistic change with age. (See discussion on Rembrandt's myopia.)

Diagnosis Entertained: Macular Degeneration, Cataract, and Glaucoma. **Basis for diagnosis:** The master demonstrated changes in style as he aged yet did not wear glasses.

Elliott, using a bit of creative logic, felt that Rembrandt did indeed suffer from a decrease in visual acuity but that the cause was from another age-related visual problem. He reasoned that since the master, a realistic painter, did not draw himself with spectacles, his stylistic change as discussed above must have been from some other age-related visual problem and he suggests macular degeneration, cataract, or glaucoma.[14] The authors find Elliot's concept difficult to accept. There is no objective evidence seen in any of the portraits to indicate cataract formation, which would have been seen as a clouding of the pupil. However, the authors do acknowledge that cataracts can impair vision before changes are seen in the lens. In addition, glaucoma does not affect the ability to focus and usually gives a peripheral rather than central field defect. Therefore, glaucoma would not explain stylistic change. Finally, without some objective evidence of these maladies, the lack of spectacles does not seem to be sufficient reason to assume that Rembrandt suffered from any of these problems.

Diagnosis Entertained: Myopia. **Basis for diagnosis:** The master demonstrated changes in style as he aged yet did not seem to need glasses.

If presbyopia was such a common problem, why is it that the master did not wear glasses? Some of the possibilities for lack of spectacles have been mentioned previously (i.e. vanity, use of glasses uncommon, etc.). However, the authors would like to raise another possibility. It could be that Rembrandt was slightly myopic (−1.5 to −2 diopter) in his youth, thus having no need for spectacles. This would have been quite beneficial for a young apprentice or artist doing intricate brush strokes or fine etchings. Then, as he aged, the natural change in architecture of the globe would cause a correction of the slight myopia. Therefore, Rembrandt's vision may have actually improved somewhat as he aged or remained at a level at which he was able to compensate sufficiently, explaining the absence of spectacles.

The question thus remains why Rembrandt changed his style if he did not have a problem with his vision. Many art historians believe that these changes were all part of a maturation of style in the artist and were a common finding with many of the great masters. In fact, if Rembrandt's early works are analyzed the authors can see this rougher technique already in use. In the Karlsruhe, c.1645 (age 39 years), the authors see rough brush strokes in the subject's coat but the style is more exact in the face. In addition, the Edinburgh self-portrait, done at the age of 53 years, is executed entirely in a very precise, detailed manner. The question of Rembrandt's use of spectacles is unresolved. However, if 1 considers how widespread the need is for spectacles after the 6th decade, and the rarity for finding them in portraits done in Rembrandt's time, it behooves the authors to consider that people who used spectacles did not wish to have a portrait that showed them wearing them. They probably felt it was a sign of old age and infirmity. Thus, the lack of spectacles would prove nothing in determining the master's visual capabilities. There are indirect clues suggesting Rembrandt probably was somewhat presbyopic and other hints indicating he used spectacles. First is the perspective demonstrated in the works done as he grew older. In the last 10 years of his life, his portraits consistently showed more of the body. This could be explained as a rendering of the true image seen by the presbyopic artist (without glasses) when he moved back from his mirror and easel to focus. This perspective suggests presbyopia, but does not address the use of spectacles. Second, some of Rembrandt's portraits done as he aged were either very small paintings or etchings. This would require some sort of magnification even if the artist at any age had no problem in visual acuity. However, the authors acknowledge this may be a more difficult task, even with corrected presbyopia.

Diagnosis Entertained: Unilateral Strabismus and Stereoblindness. **Basis for diagnosis**: Different points of focus for each eye in many of the master's self-portraits.

An additional visual problem attributed to the artist is unilateral strabismus, as evidenced by the slight deviation of angle between the 2 eyes as seen in his self-portraits and etchings.[20] Livingstone felt that this strabismus left the artist stereoblind and this stereoblindness was to the artist's benefit, since it allowed him to gauge perspective more accurately. It would be similar to how an artist closes 1 eye to better frame a model. In support of their theory, they noted that this deviation was a consistent finding and changed sides when the portrait was made as an etching, since the final image is done as a reverse print from the etching. In a comment on this article, Marmor disagreed with Livingstone and felt that the angular deviation could be explained by the way the painter would focus on 1 eye at a time as he gazed into his mirror. The change in angle for each eye would cause a slight movement of the globe.[21]

The authors of both articles were perhaps unaware that Rembrandt's stylistic development was particularly influenced by the portraits of earlier artists,[4] particularly Albrecht Durer. For stylistic reasons, Durer, and other painters, often gave their subjects an asymmetrical eye gaze[1] (Figs. 4 and 5). Moreover, many of Rembrandt's pupils executed portraits with subjects having 1 eye lateralized, as if suffering from strabismus. Apparently, Rembrandt's use of the asymmetrical eye gaze was intentional. This is supported by infra-red reflectographs of the Nuremberg 1,629 self-portrait, in which the outer upper layer shows Rembrandt with the exotrophic eye motif, but the under (first) layer shows a symmetrical position.[1] This asymmetrical eye position was a stylistic motif popular among artists of the 15th to 17th centuries, used by Rembrandt, as well as some of his best pupils,[1] and should not be the diagnostic criteria for stereoblindness. Furthermore, by looking at factors including angle kappas, head turn, and perceived direction of gaze, Mondero, Crotty, and West[21] claim that iris placement alone is insufficient evidence to advocate strabismus. They suggest that the appearance of strabismus in certain paintings was merely used for artistic style.[21]

FIG. 4. Rembrandt's self-portrait 1640. National Gallery, London. There are equally obvious connections with Durer's self-portrait of 1498 (Fig. 5).

FIG. 5. Albert Durer, self-portrait 1498. Museo del Prado, Madrid.

In addition, experts in the field are convinced that Rembrandt's ability to reproduce a feeling of depth in his works indicates that he could not have been stereoblind.[22]

Diagnosis Entertained: Yellow Brown Vision. **Basis for diagnosis**: A tendency for Rembrandt to use paints in the yellow-brown range as he aged.

Another possible visual problem is based on Rembrandt's preference to use yellow-brown pigments as he aged. This has led some authors conclude that Rembrandt suffered from a color-vision defect causing him to see things with a yellow-brown tint. Ravin[16] and Trevor-Roper[17] felt that this was the result of changes in the painter's lenses or the gradual formation of a cataract. Ravin postulated that this was the result of discoloration of the lens itself. Surprisingly, none of the authors suggested digitalis intoxication. Digitalis, given as the medicinal herb foxglove, was in common clinical use in Rembrandt's time and is known to cause yellow vision.[23]

Although all these suggestions are interesting, the authors doubt they are the cause for Rembrandt's drawing yellow brown. In fact, the authors are not convinced that indeed this yellow-brown preference appeared as he aged. Rembrandt was influenced by his teacher's, Peter Lastman, colorful style. But already in his 20's, Rembrandt adopted a more oligochromatic color scheme, preferring black, white, brown, red, ochre, and pink.[1] Therefore, the authors feel that the diagnosis of a color-vision defect is not well supported, and this color change is purely stylistic.

Part III: Eye and Adnexa. *Diagnosis Entertained: Xanthalasma, Pinguecula, and Arcus Senilis.* **Basis for diagnosis**: Suggestion of these findings in the Washington self-portrait.

Espinal, apparently analyzing only the Washington self-portrait, done when the artist was age 53 years, claimed that Rembrandt suffered from xanthalasma, pinguecula, and arcus senilis. He found white-beige plaque-like areas on the master's eyelids and claimed these were xanthalasma. There was also an elevation of the left nasal conjunctiva and felt this represented pinguecula. Finally, he felt that the white arc noted inside the iris of the left eye represented arcus senilis.[4] However, if Espinal had scrutinized the subsequent self-portraits, he would have been unable to corroborate these findings, and since these problems would not have disappeared on their own it is highly unlikely that these were true problems suffered by the artist.

CONCLUSION

In summary, the authors believe that all the physical changes seen in Rembrandt's portraits represent natural age-related changes in physiognomy or stylistic maturation, and were not signs or symptoms of diseases in the master. The changes seen in the Washington portrait, and some others that have suggested many different diseases, were most likely simple renderings of light reflection, shadows, and a maturation of Rembrandt's artistic style. It is unlikely that they represent a specific disease in the master. The authors believe that Rembrandt did not suffer from any major ophthalmological disability and any attempts to diagnose such disease states are purely a form of intellectual exercise.

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