



Leonardo Da Vinci's Archival of the Dermatologic Condition

Edward Haderler¹

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Abstract

The interconnection of scientific studies and art represented by Leonardo Da Vinci's (1452–1519) portraiture accentuates his role in documenting and archiving dermatologic conditions. His anatomical dissections, sketches, and paintings, including portraits, were all a means to observe, portray, and understand the nuances of the human body. In two of his most discussed portraits, *Ginevra de' Benci* (1474–1478) and *Elisabetta del Giocondo, the Mona Lisa* (1503–1506), Leonardo's execution of the exterior anatomy is so precise that he may have illustrated manifestations of disease that allow contemporary researchers to theorize diagnoses of dermatologic as well as neurologic, endocrine and vascular conditions. These include hypochromic anemia, muscular disorders, xanthelasma, thyroid disease, lipoma, and frontal fibrosing alopecia. Leonardo's extraordinary talent in recording his observations of shades and textures of skin and his ability to capture the nuances of subtle variations in the human body have produced a historical record that allows modern dermatology practitioners to make further observations not possible in his time. Here, dermatology and art intersect serving to document and explain the human condition, permanently archived in Leonardo's masterpieces.

Keywords Leonardo Da Vinci · Leonardo · Art · Painting · Portraiture · Dermatology · Dermatologic · Dermatologic disease · Skin disease · Mona Lisa · Ginevra de Benci · Medicine · Anatomy · Skin · Dermatologic condition · Humanities

The interconnection of scientific studies and art represented in Leonardo Da Vinci's (1452–1519) portraiture accentuates his role in documenting and archiving dermatologic conditions. His anatomical dissections, sketches, and paintings, including portraits, were all a means to observe, portray, and understand the nuances of the human body. Leonardo's depiction of the skin is an excellent example of how he used portraiture to precisely convey the human condition, and physical cues in his work have led researchers to speculate that the artist may have been describing dermatologic diseases.

Leonardo Da Vinci studied anatomy to a degree of detail achieved by none of his predecessors. At a time when the scientific community was barred from performing dissections due to the Catholic Church's disapproval (Cunningham 1997), Leonardo claimed to

✉ Edward Haderler
ehaderler@med.miami.edu

¹ University of Miami, Miller School of Medicine, 1600 NW 10th Ave #1140, Miami, FL, USA

have conducted around thirty (Jones 2012). The resulting diagrams, which reflect muscles, bones, vessels, nerves, and organ systems, aided understanding of both form and function, particularly as Leonardo, an artist, architect, and engineer, applied his understanding of different fields of science to make observations of internal and external anatomy in his sketches and art. One example is his study of hydraulics and vortices to make predictions about the flow of blood through heart valves, the aortic tract (Gharib et al. 2002), and also to describe and depict the curling of hair (Gombrich 1994). Within his portraiture, he applied his understanding of the science of perspective, light, shade, color, and geometry to characterize variations in the anatomy of his subjects (MacCurdy 2002).

As Leonardo's anatomical study deepened, he established a treatise on painting, firmly stating that painting had importance both as a theoretical and scientific practice. His work displayed his concern with appearance, but it was his emphasis on accurately portraying the condition of his subjects that inspired him. His keen observation of the nuances of the human body and even the health of his subjects is highlighted in the detailed depictions of the skin in his portraiture. In two of his most discussed portraits, *Ginevra de' Benci* (1474–1478) and *Elisabetta del Giocondo, the Mona Lisa* (1503–1506), Leonardo's execution of the exterior anatomy is so precise that he may have illustrated manifestations of disease that allow contemporary researchers to theorize diagnoses of dermatologic conditions.

Ginevra de' Benci (1474–1478)

In the portrait of Ginevra de' Benci (1474–1478), Leonardo highlights his innovative approach to portraiture, depicting a young woman in oil paint on panel in three-quarter-angle pose (Figure 1). The pose was one of the first recorded portraits in this position and allowed for better visibility of the facial anatomy. He transitions colors from light to dark,

Figure 1 *Ginevra de' Benci*, by Leonardo Da Vinci, 1474–1478



conveying the textures of her face. Her face is encircled with dark, precisely drawn, curling hairs, juxtaposed with light skin. Leonardo's masterful use of shadow molds her cheeks, nose, and lips.

Medical practitioners would be drawn to both her very pale complexion and a mysterious expression that appears void of emotion. Dr. William Crosby suggested that her paleness, which also has a slight greenish hue, may indicate that she suffered from hypochromic anemia, historically known as chlorosis or green sickness (Hoenig 2013). This conclusion was based primarily on her complexion.

Lay-Son hypothesized that her flat, emotionless face was due to an underlying muscular disorder (2012). These conclusions are based on Ginevra's gaze pattern with her eyes slightly focused on different targets. He also notes that her eyelids have a degree of heaviness, evident of mild ptosis. Such findings combined with her void, expressionless mouth, led Lay-Son to postulate that the subject was suffering from a disorder of motor paralysis with subsequent muscle atrophy.

Elisabetta del Giocondo, the Mona Lisa (1503-1506)

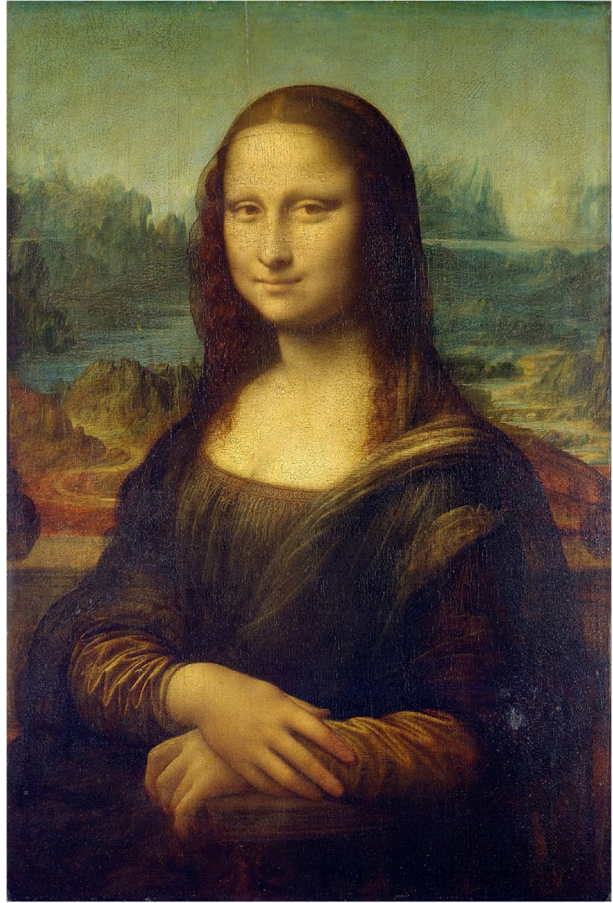
Nearly thirty years later, a more experienced Leonardo produced one of history's most striking portraits: the portrait of *Elisabetta del Giocondo, the Mona Lisa* (1503-1506) (Figure 2). Here, Leonardo's mastery of color, texture, and shading around the face and mouth, creates subtle gradations that highlight his understanding of the structure of the face and its internal anatomy.

Multiple physical clues in the portrait have drawn interest from the medical community. Elisabetta's skin has a slight yellowish tint although some postulate this could be the result of years of accumulated varnish (Thompson 2016). An irregular lesion is depicted in the corner of her left upper eyelid, and the outline of her neck extends just slightly, creating the appearance of a slight swelling. Shading above her right index finger also indicates a lump on the dorsum of her right hand. Hair painted high on the forehead and minimal dark paint to the eyebrows creates the impression of a high receding hairline coupled with thinning eyebrows.

Dequeker et al. hypothesize that the eyelid lesion represents an accumulation of cholesterol under the skin, characteristic of xanthelasma, a finding associated with hyperlipidemia (Dequeker et al. 2004). This finding, in conjunction with the possible yellowish tint of her skin, swelling of her neck, and thinning of her hair indicated by the high hairline, has led Mehra et al. to propose that she suffered hypothyroidism with secondary hyperlipidemia (Mehra and Campbell 2018). They write that during the Renaissance period, the Italian diet was primarily vegetarian and was often iodine deficient, which could lead to the development of goiter and subsequent hypothyroidism (Morrison et al. 1985). Given that Mona Lisa had children and that hypothyroidism can present secondary to pregnancy, others suggest she may have suffered from postpartum thyroiditis.

Nazzaro and Veraldi propose that the thinning of the hair in a thick, banded pattern accompanied with thinning or absent eyebrows is characteristic of frontal fibrosing alopecia (2017). However, it's possible that this hair loss pattern is characteristic of a pseudo alopecia, as plucked hair in the frontotemporal region and eyebrows was a theme of fashion seen in the Middle Ages and Renaissance, and similar patterns of hair loss are evident in other portraits (Dotz 1983). Other diagnoses to consider are hair loss occurring after pregnancy, known as postpartum telogen effluvium or traction alopecia secondary to excessive wearing of headdresses (Campbell and McKenna 2020). Perhaps

Figure 2 *Elisabetta del Giocondo, the Mona Lisa*, by Leonardo Da Vinci, 1503-1506



one missing clue may lie on her hidden feet or wrists. The medical literature recently reported a case of papules on the wrists and feet, characteristic of lichen planus, which, coupled with a similar pattern of hair loss to the Mona Lisa, supported a diagnosis of frontal fibrosing alopecia (Faulkner et al. 2002).

Leonardo's extraordinary talent in recording his observations of shades and textures of skin and his ability to capture the nuances of subtle variations in the human body have produced a historical record that allows modern dermatology practitioners to make further observations not possible in his time. He potentially documented not only dermatologic disease but also neurologic, endocrine and vascular disease. Here, dermatology and art intersect serving to document and explain the human condition, permanently archived in Leonardo's masterpieces.

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