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BRIEF COMMUNICATION

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ADULT CARDIAC

Sandro Botticelli's *Madonna of the Pomegranate*: the hidden cardiac anatomy

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Abstract

Sandro Botticelli was one of the most renowned artists of the 15th century. He was based in Florence during the flourishing of the Renaissance, a time when anatomical knowledge of ancient times was reclaimed through cadaveric dissection. This report proposes that such knowledge enabled Botticelli to enhance the iconography of his masterpieces, *Madonna of the Pomegranate*, by incorporating a concealed image of the heart and cardiac anatomy within it.

Keywords: Heart • Art painting • Cardiac chambers • Botticelli • Medical diagnosis

THE PAINTER

Alessandro di Mariano di Vanni dei Filipepi (1445–1510), better known as Sandro Botticelli, was one of the most esteemed artists of the Florentine Renaissance. Admitted into the De' Medici family's circle, Sandro spent almost his entire career in Florence, giving shine to his city and citizens better than many other masters of the Renaissance [1, 2]. In the latter part of the 15th century, Botticelli was exposed to the resurgence of interest in human anatomy and in the reclamation of the lost medical knowledge from ancient times, by Renaissance artists through the dissection of the corpses [3]. Indeed, at that time, Italian Renaissance artists considered it a necessity to become anatomists, in their attempt to produce a more life-like, sculptural portrayal of the human body, as '. . .having seen human bodies dissected one knows how the bones lie, and the muscles and sinews, and all order of conditions of anatomy. . .' [2]. According to the new Renaissance wave, art should not just be a copy of the classic nudes of antiquity but a bearer of a new spirit for which anatomical dissections were crucial to better reproduce the body, its movements and functions, as well as its supporting structures in art.

Though his popularity increased throughout his lifetime, Botticelli's reputation and contribution virtually faded until his rediscovery in the 1890s, when he was greatly acclaimed by the Pre-Raphaelites [2]. He left us such masterpieces as *The Primavera* and *The Birth of Venus,* as well as several other immortal altarpieces and works with mythological and religious themes among which include the *Madonna of the Pomegranate*.

THE PAINTING

In 1487, Botticelli painted one of his masterpieces (Fig. 1), the title coming from the fruit held in Mary's hand [1]. The motif of a pomegranate appears in Christian religious paintings as a symbol of the fullness of Jesus' suffering and resurrection. The red seeds are intended to recall the blood shed by Jesus to save humankind. Furthermore, the pomegranate has a calyx shaped like a crown, serving to highlight the regality of the baby holding it.

The pomegranate is intriguingly depicted as peeled in a portion to reveal non-symmetrical chambers, the shape of which follows an anatomical scheme similar to the cardiac chambers (Fig. 2). Botticelli portrayed the inner spongy membranes dividing the arils (seed pods) into 5 spaces resembling the atria and ventricles and the main pulmonary trunk. The crown is separated into 2 parts mimicking the superior vena cava and the arch of aorta with its 3 branches. The fruit is also held in front of the left side of the chest overlying the position of the heart. These surprising analogies with the actual cardiac anatomy and its depiction over the chest make likely the hypothesis of a heart hidden in the fruit held by Mary and Jesus.

THE POMEGRANATE IN OTHER RENAISSANCE PAINTINGS AND IN NATURAL SECTIONS

To support our hypothesis, we analysed the resemblance and differences to previous paintings with the same motif. In their portrayals of '*Madonna of the Pomegranate*', Beato Angelico,

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Leonardo Da Vinci and Pier Francesco Fiorentino represented the fruit divided into 2 parts with no details about the inner membranes and the division of arils. Pinturicchio and Raffaello Sanzio's paintings did not reveal the inside of the pomegranate.

Photos of sliced and partially peeled pomegranates fail to reveal such similar or precise architecture as those depicted by Botticelli, lending some support to our theory.

Figure 1: '*Madonna of the Pomegranate*' (1487), by Sandro Botticelli, oil on wood (from the Galleria degli Uffizi, Florence, Italy).

DISCUSSION

From the 13th century, accurate anatomical studies were performed by Mondino de Luzzi (1270–1326), also known as Mundinus, a physician and Professor of Surgery, who worked in Bologna. He founded the first European School of Anatomy and wrote in 1316 the '*Anathomia corporis humani*', the most widely used anatomical text for 250 years [4]. In his description of cardiac form and function, Mondino, like Aristotle, believed that the heart's central position in the body demonstrated its role as the 'source and ultimate root of all the organs'. Further contributions to the description of cardiac anatomy were provided by the 15th century Bolognese physician Girolamo Manfredi in his chapter on the heart.

Few details remain about Botticelli's life as a potential anatomist, with no reports of dissection or anatomical drawings attributed directly to him. Several renaissance painters such as Pollaiuolo, Signorelli and Botticelli were known to have attended anatomical lessons at the Bologna medical school, and most of them, including Leonardo, were influenced using Mondino's and Manfredi's books as dissection manuals and as a primary source of medical knowledge [3]. Moreover, given the friendship and mutual admiration with Leonardo da Vinci, Botticelli may well have been aware of Leonardo's extensive collection of anatomical drawings including his studies of the heart. Leonardo was one of the first to describe the heart as a muscle and consider the atria as cardiac chambers, providing the first known description of coronary artery disease, and created incredibly accurate sketches on the workings and structure of the heart and cardiac valves.

This report is not the first to highlight concealed anatomical imagery in Renaissance artworks, with fascinating reports regarding hidden imagery within frescoes and paintings being previously published [2]. Meshberger [5] asserted that Michelangelo

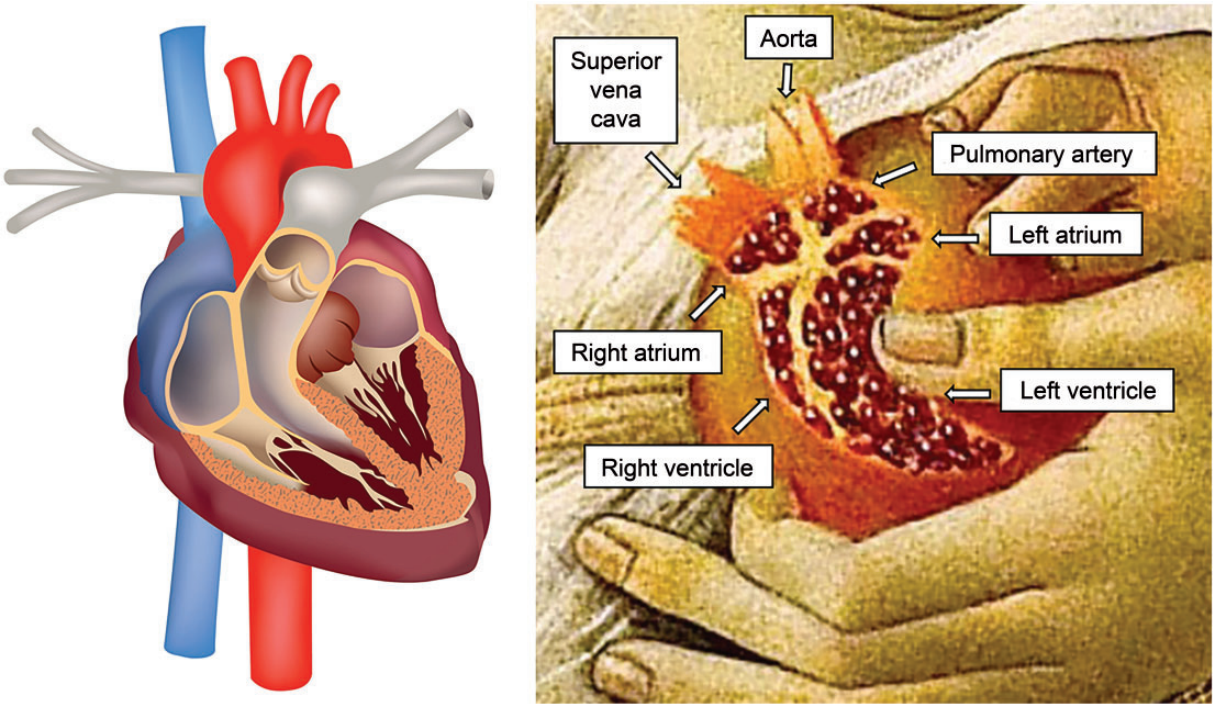

Figure 2: The heart-shaped part of the peeled pomegranate in the '*Madonna of the Pomegranate*' is compared with a medical illustration of the heart.

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concealed the image of a brain in *The Creation of Adam*, whereas Eknoyan [6] argued that in the *Separation of Land and Waters*, Michelangelo incorporated the image of a bisected right kidney in the mantle around God. Suk and Tamargo [7] suggested that Michelangelo incorporated a ventral view of the brainstem within the image of God in *The Separation of Light From Darkness*. Tranquilli *et al.* [8] interpreted the shape of the robe of God in *The Creation of Adam* as a post-partum uterus. According to Ambrogi [9], Piero della Francesca depicts in 2 paintings a necklace of coral for the infant Jesus that follows the anatomy of the trachea and the main bronchi. Recently, Blech and Doliner [2, 10] reported that Botticelli concealed an image of a pair of lungs in *The Primavera,* whereas Lazzeri proposed that he also embedded the lung imagery in *The Birth of Venus*. These findings, corroborated by evidence from analyses of the artist's life and influences, are gaining the assent of art historians.

Art history is characterized by disputes about the attributions and meanings of artists because the interpretation of an artist's intention is speculative, unless there are written documents that reveal the real intention of the masters. Therefore, art historians need to sustain their theories with circumstantial proof supported by experience and cumulative analyses, as do professionals in the medicoartistic field. The current interpretation of Botticelli incorporating anatomical imagery in his masterpieces will remain speculative because of a lack of clear documentation though should be considered plausible given the available evidence.

Conflict of interest: none declared.

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