Author's response to reviews

Title: Federico di Montefeltro's hyperkyphosis: a visual-historical case report

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Dear JMCR editorial team,

We graciously accept your offer to revise our manuscript and address the referees’ comments, as delineated in your e-mail sent to us on September 23, 2007. We thank the referees for their time and feedback. We appreciate the peer review process and thank the editors for giving us the opportunity to revise our manuscript in preparation for publication. In this letter, we will specifically address those comments offered to us by Dr. Brian Hurwitz, and we are responding to his thoughtful comments point by point.

1. “The paper takes the form of a evidence based report which draws on the observations of the authors and on a formal search for papers (with some atypical features) that address these questions.”

Our purpose was to present a teaching strategy that can be used in medical education to develop medical students’ observational skills prior to their clinical training. The question is: “As a result of engaging in this educational exercise, would medical students be able to develop a differential diagnosis list to explain a prominent thoracic hyperkyphosis in a patient standing in front of them before they engaged in a history and physical examination?” Our experience has been that students can, in fact, do so after being presented this visual-historical case, and this is the real measure of whether our manuscript is meaningful. We have presented this case in a novel way, and we believe that it would appeal to the readership of the JMCR. We did not intend to present an exhaustive treatise on the history of art or the life of Piero della Francesca. However, we agree that our conclusions needed more justification and we have taken formal steps to correct this in our revised manuscript.

2. “The evidence that this renowned C15th fighter suffered from a thoracic hyperkyphosis which the authors assert is the prominent acute bend seen in the Uffizi portrait in the mid-thoracic area, but this is much less discernible in the Brera portrait of the Duke adoring the Madonna.”

Dr. Hurwitz is referring to the painting Madonna of the Egg by Piero della Francesca, which is housed in the Pinacoteca of the Brera Academy in Milan, Italy. The Duke’s hyperkyphosis is clearly discernible in this painting. If you observe the neck of the Duke and follow it posteroinferiorly, you will note the transition between skin and armor. The contour of the silver-colored armor is convex and quite striking, especially when compared against the red cloak of the figure holding the book behind the Duke. What confounds this area is the Duke’s red and gold damask cape that hangs down his back.
Yet, the intersection of the armor and the cape reveals the prominent inferior bend of the hyperkyphosis. In this painting, the Duke is kneeling and his upper body is straight and rigid, a posture that would be expected of someone kneeling while wearing a suit of armor. As expected, the Duke does not display a stoop; however, it should be noted that a stoop is not always associated with a hyperkyphosis (1,2). The fact that there is no stoop with the hyperkyphosis further suggests an anomaly and not simply a stylistic variant by Piero della Francesca.

3. “The authors produce no other circumstantial evidence that suggests that the Duke had this spinal deformity – eg they have found (have they looked for it?) no contemporary documentary evidence concerning his appearance, or health, that his fitness or ability to fight was impaired by backpain or difficulty maneuvering.”

There is little documentation about the Duke’s physical health aside from a facial skin disease that he had as a young man (see the skin folds on his left jaw in The Duke and Duchess of Urbino by Piero della Francesca) (3), his bouts of gout (4), and the story of his missing nasal bridge (5). The reliability of this information, particularly as it relates to his nose, has been questioned in the literature. Santoni-Rugiu and Massei (5) stated that most people believe that the Duke’s nasal bridge was surgically removed to increase his field of vision during battle. These authors pointed out that the true details concerning the Duke’s nose were covered up in the historical record. They wrote that Roberto Papini (1946) discovered that some of the original documents of the Duke’s life, recorded by Giovanni Santi, had been covered up by plastering another sheet over the documents. When these covering sheets were removed, it was discovered that the Duke was having an affair with a woman who attended the jousting tournament. When the Duke saw his mistress in the crowd, he decided to joust even though he was not scheduled to do so on that fateful day in 1450. In order to impress his mistress, he adorned his horse and helmet with tree branches. The branches kept his visor open and exposed his nasal bridge, which was crushed by his opponent’s lance. We have not come across any documents suggesting that the Duke had back pain or a hyperkyphosis. Because a hyperkyphosis does not have to be associated with pain (ie, it can be asymptomatic), the gap in the historical record regarding whether the Duke had back pain or a hyperkyphosis does not rule out the existence of the hyperkyphosis.

4. “However, any such deformity is not suggested in depiction of the Duke on the rear of the Uffizi portrait, where he is seen seated on a chair on a triumphal chariot pulled by 2 white chargers (see A4 colour frontispiece plate in Kenneth Clark’s Piero Della Francesca, London, Phaidon Press Ltd 1951).”

We have examined this painting from Clark’s text, as well as other reproductions of the painting found in other texts. The figures in this painting, including that of the Duke, are extremely small and the details are obscured. The Duke is seated at the rear of the chariot, he is in right lateral view, and his nasal bridge is intact. Inspection of his neck at the skin-armor interface and moving in a posteroinferior direction reveals the hyperkyphosis, although it is not as prominent as that found in The Duke and Duchess of Urbino or the Madonna of the Egg. Like the Madonna of the Egg, the Duke wears a red cape in this painting that dampens the hyperkyphosis and the shoulder armor, which, is linked in pieces, has the same effect. (Compare the armor in this painting to that in the Madonna of
Furthermore, the Duke was younger in this painting than in the other two, and therefore, the hyperkyphosis may not have been as prominent.

5. “It is also not visible in Pegro Berruguete’s ¾ side-on (from the front) portrait of the Duke (where again he is in armour) which is in the Palazzo Barberini in Rome (Clark figure 61).”

We have examined this painting, which was recently displayed in an exhibit at The Morgan Museum and Library in New York City. Here the Duke is not in perfect lateral view but is seen slightly oblique so that the left shoulder obscures the back. Consequently, examination of the hyperkyphosis is impossible but the convexity is certainly suggested since the contour of his neck slopes posteroinferiorly like that depicted in the other paintings.

6. “In none of these depictions is there any hint of an associated stoop – in all the pictures mentioned the Duke has an upright and straight military bearing.”

As mentioned previously, the fact the Duke has the hyperkyphosis while maintaining an upright posture lends credence to the idea that this was an anomaly. A stoop may be seen in old age or associated with an osteoporotic spine; however, it does not have to be associated with a hyperkyphosis (1,2).

7. “The authors state that ‘other portraits of the Duke by different artists in which he is depicted in perfect lateral view also reveal the hyperkyphosis’ but supply no references.”

We have addressed this issue in our revised manuscript. Other portraits of the Duke by different artists in which he is depicted in perfect lateral view also reveal the hyperkyphosis. For example, the medal by Sperandio of Mantua depicts the Duke in left lateral view and clearly illustrates the convexity at the same vertebral level as that portrayed in the paintings by Piero della Francesca. The medal by Pauli de Ragusio (National Museum of Ireland, Dublin) also depicts the Duke in left lateral view with the convexity (6). Close inspection of the Duke’s neck in this medal reveals a posteroinferior slope at 45° that is interrupted by a bump, which represents the superior aspect of the hyperkyphosis. A portrait of the Duke by an unknown painter, displayed in the Museo Civico di Urbania (Urbino, Italy), also reveals the Duke’s convexity in left lateral view (5). The portrait of the Duke with his son Guidobaldo by Pedro Berruguete, which was recently displayed in an exhibit in New York City at The Morgan Library and Museum, does not depict the Duke in left lateral view. Instead, the Duke is slightly oblique so that his left shoulder obscures the back. Therefore, examination of the hyperkyphosis is impossible but the convexity is suggested, since the contour of his neck slopes posteroinferiorly like that depicted in Ragusio’s medal. Finally, in the painting by Joos van Ghent, the Communion of the Apostles (Galleria Nazionale delle Marche, Urbino), the Duke is seen on the right in the background. His shoulders are oblique and a cloth is placed over his left shoulder, which hides the hyperkyphosis. However, his face is shown in left lateral view and the slope of his posterior neck line is similar to that seen in other paintings.
8. “One cannot assume an identity between what is seen in a painting – which is the result of the artifice of a representation – and what exists within the clothing and flesh of the person represented. However, the authors treat the Uffizi portrait as definitive X-Ray-like evidence, which on its own it clearly is not.”

The spinal level of the convexity of the hyperkyphosis was estimated by examining *The Duke and Duchess of Urbino* and counting the level from the C7 vertebra (vertebra prominens), which is a well known (see Bates’ Guide to Physical Examination and History Taking or the Textbook of Physical Diagnosis: History and Examination by Schwartz). Obviously, this is an estimation and we have revised the wording in the manuscript.

9. “It is quite inappropriate for the authors to dismiss the possibility that this appearance is not a manifestation of Piero’s style, (ie the degree to which Piero presents bodily forms in a manner that emphasises such a bend in this position in his figures) by pointing to the fact that it cannot be seen in the portrait of his wife Battista Sforza.”

We have strengthened our argument that the Duke’s hyperkyphosis was not a stylistic variant by Piero della Francesca. This artist is known for his exactitude in painting faces, figures, and forms (3,7-9). Among his contemporaries, della Francesca employed models for his paintings and a purview of his work reveals other anomalies. For example, see the prominent goiter in the sleeping soldier in the painting *The Resurrection* (Clark, Plate 111 and the close-up in Plates 113 and 114). Dr. Hurwitz points out the moles on the left side of the Duke’s face in della Francesca’s *The Duke and Duchess of Urbino*. The skin color, wrinkles, and other features of this painting are striking and we argue that the hyperkyphosis seen in the Duke and not his wife (Battista Sforza) is not simply a stylistic variant.

10. “One of the right hand female, adoring figures kneeling (in full side on portrait) within the robes of the Madonna Della Misericordia in San Sepulcro (Clarck plate 1).”

In Plate 1 of Clark’s text, the caped woman (who appears young) on the right has her hands crossed over her chest, and she is kneeling with three other women. She is not displaying an aberrant hyperkyphosis or stoop. The slight stoop and kyphosis displayed in this woman is normal for someone who is bending forward and kneeling with the arms crossed—this is the expected posture based on her position. Notice how she is looking up at Mary while her neck is sloped forward and her head is slightly turned. In this position, the scapulae reposition laterally and the thoracic spine assumes an accentuated kyphosis. This woman is also displaying a prominent anterior head carriage, but again, this is not aberrant based on her position.

11. “Adam and Eve (both in full side on portrait) in *The Death of Adam in Arezzo* (Clark plates 31 and 32) – here the Adam’s thoracic bend is comparable to that in the Uffizi Duke’s depiction. Even though Adam is seated naked, announcing his death, his head is upright, unlike Eve’s which is drooping, probably in sadness, but possibly also because of a stooped, kyphotic posture of old age.”

This is not a stylistic variant by Piero della Francesca. Both Adam and Eve are very old and their hyperkyphoses are due to age or possibly osteoporosis. Eve has an associated
stoop as does Adam, although his is more subtle. Because of Adam’s seated position, a stoop is not discernible; however, notice the distance (gap) between Adam’s lumbosacral spine to the back of the chair. If the distance was narrowed such that his lumbosacral spine was juxtaposed to the back of the chair, then a stoop would certainly be present like that seen in Eve. This painting is a clear example of the observational skills of Piero della Francesca and illustrates the artist’s ability to capture the subtleties of the spine as one ages.

12. “One of the upper thoracic bends in two young women (both in full side on portrait) within in the retinue of the Queen of Sheba, in the Queen of Sheba’s Visit to Solomon in Arezzo (Clark plates 39+40) shows as acute an angle as that seen in the Uffizi portrait.” There is a bend in this figure and the woman has an extremely long neck. However, to suggest that this painting proves that the hyperkyphosis of the Duke is a stylistic variant is problematic because Piero della Francesca clearly did not paint hyperkyphoses in all of his figures. For example, the *Portrait of Sigismondo Malatesta* (circa 1450, Louvre, Paris) by della Francesca shows a left lateral view of Sigismondo with his neck and upper thoracic spine silhouetted against a black background. Here there is no hint of a hyperkyphosis—this area of the spine displays normal curvature.

13. “One of the mail courtiers (3/4 portrait from the front) to the left of Solomon also shows the thoracic bend (Clark plate 47 and 49).” This courtier does have a convexity that may be due to obesity (buffalo hump). Notice the skin fold of the posterior neck, the loss of definition of the mandible, and the skin under the chin. Compounded with his size, these signs suggest obesity. This representation is different than that of Federico di Montefeltro, and does not prove that the Duke did not have a hyperkyphosis.

14. “The Discovery and Proof of The Cross Arezzo (Clark 65, 67,69) shows a young man with a spade (3/4 portrait from the front) with a possible thoracic bend.” The bearded man with the spade in this painting does not have a hyperkyphosis. His shoulders are oriented obliquely and this completely obscures his back. Moreover, he is leaning forward on the spade such that his head is anteriorly displaced. This is normal posture for a person in such a position. Notice the flexion of his right leg so that only the forefoot touches the ground, and how he is leaning on the spade for support. The spade is not perfectly vertical but is on a slight angle from the ground in order to hold the man upright.

15. “It is inconceivable that all these figures, even if drawn from life, could have suffered from thoracic hyperkyphosis. Only Eve is stooped – and that is most likely a sign of her sadness. A much more likely explanation is that provided by the authors themselves, but too peremptorily dismissed by them: this is a stylistic feature of Piero’s monumental human forms and on its own it cannot be taken to signify anatomical anomaly.” We agree with the first sentence of this comment. However, we have demonstrated that not all of the examples mentioned by Dr. Hurwitz are anomalous—many are shown as they would be based upon movement and position of the figures. To suggest that Eve (in the painting *The Death of Adam*) is stooped because she is sad ignores the physical
evidence: her advanced age, the color of her hair, and her sagging breasts. We have demonstrated many more examples of portraits painted by Piero della Francesca and others to support our thesis that the Duke had a hyperkyphosis.

16. “The authors’ first differential diagnosis is correct and moreover this deformity has apparently not been previously noticed.”

Physicians observe individuals through a pathologic lens. They are trained to look at anatomic structures (eg, eyes, ears, and fingers) for signs of disease. Most artists are not formally trained in medicine and thus use a different lens when viewing art. This explains why the Duke’s hyperkyphosis has not yet been described. However, there have been reports published in the medical literature that describe signs of disease in paintings from Rembrandt to Caravaggio. We believe that our report will add to this growing body of literature.

17. “A simple survey of some of Piero della Francesca’s major works reveals that he painted many figures in profile with acute bends in their mid-to-upper thoracic spine.”

We disagree with this comment and have addressed this in the preceding paragraphs.

We thank you for the opportunity to address these comments.

Sincerely,

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References