Realdo Colombo (1516-1559)

A Reappraisal

G.	Garabed	Eknayan ^a
N.G.	Natale G.	DeSanto ^b

^aRenal Section, Department of Medicine, Baylor College of Medicine, Houston, Tex., USA; ^bDivision of Nephrology, Department of Pediatrics, Second University of Naples, Italy

Key Words

Realdo Colombo
Michelangelo
University of Padua, Renaissance Anatomy
Anatomy and art

Abstract

A pupil and then the successor of Vesalius to the Chair of Anatomy and Surgery at the University of Padua, Matteo Realdo Colombo (1516-1559) was equally consumed by the flame of scientific inquiry and recognition. His sole contribution to the literature, *De Re Anatomica*, was published after his death in 1559. In it, he correctly describes the position of the right kidney as lower than that of the left and provides the best description of the pulmonary circulation before that of William Harvey, who in his text duly acknowledged Colombo's contributions. In the concluding chapter, he establishes the beginnings of morbid anatomy in describing diseased organs. *De Re Anatomica* was widely used as a textbook of anatomy, being translated into English in 1578 and German in 1609. He came to be sufficiently well known to become physician to the Vatican. One of his best known patients was Michelangelo, with whom he vainly tried to collaborate in illustrating *De Re Anatomica*. A regrettable eventuality, which could have reversed the fortunes of Vesalius and Colombo in the annals of the history of medicine.

G. Eknayan, MD, Department of Medicine, Baylor College of Medicine, One Baylor Plaza, Houston, TX 77030 (USA), Tel.+1713 798 4748, Fax+1713 790 0681

Rooted deep in the origin of medieval centers of learning, the University of Padua (founded 1222) attained preeminence in the 16th century for the pioneering work in anatomy of several scholars who were attracted to it [1-3]. The legendary position that its anatomy theater (built 1594) has come to occupy is a venerable icon of those early contributions. The fame attained by its better-known luminaries (Vesalius, Harvey, Morgagni) has come to overshadow the contributions of several of its equally competent, and at the time probably equally prominent, faculty. It is one of those, Matteo Realdo Colombo (1516-1559), who is the subject of this report. A pupil of Vesalius (1514-1564), he was equally consumed by the flame of scientific recognition as a stepping stone to the competitive world of medical consultant to the mighty and powerful. The aptitudes and contributions for which Colombo was well recognized at the time are dimmed by the well-deserved and exalted place in the history of medicine that Vesalius has come to occupy for his *De Humanis Corporis Fabrica Libri Septem*, published in 1543.

While best known for the anatomical illustrations of the *Fabrica*, the principal contribution of Vesalius to anatomy, and

one of his links to Colombo, is his professed revolutionary approach to the study of anatomy, symbolically represented in the frontispiece to the *Fabrica*. Beginning in the late 13th century at the Medical School of Bologna, anatomic dissection had come to be considered important to medical training. By the 15th century, anatomy had become an integral component of the

medical curriculum [4, 5]. However, anatomy then had a more restricted meaning than it has today. Derived from 'no-tomia' it simply meant dissection, and anatomists were those who dissected the bodies of animals or humans. Thus, throughout this period the role of the teacher or professor was to preside over the dissection while an assistant (dissector, anatomist), usually a barber-surgeon, performed the actual dissection and a demonstrator (ostensor) pointed out the structures about which the teacher lectured or read from an anatomical text, usually that of Galen (130-200). In fact, this is the often reproduced classic anatomy scene (fig. 1) that originated from the frontispiece of Mondino, *Anatome Omnium Humani Corporis Interiorum Membrorum*, published in 1316 [6]. Galen's characterization of the human body as a 'sacred discourse composed

KÄIUÏER

E-Mail karger@karger.ch Fax + 41 61 306 12 34 <http://www.karger.ch>

© 1997 S. Karger AG, Basel O25O-8095/97/0174-0261 \$ 12.00/0

V^ < tSltE↔çF* 9EX /Ö^K·h'EM OVOKIKVAt

as a true hymn to our Creator' had established his authority with the Church. His works on anatomical procedures and on the structure and usefulness of the parts of the body were the standard texts followed in teaching anatomy [7]. Dissection was used to facilitate the comprehension of what Galen had written, not as a means by which the truth of what Galen was saying might be tested. Truth and science had come to mean that which was written, not that which was observed at dissection. It is this method of teaching by his predecessors that Vesalius criticized in the text, and satirized in the frontispiece of *Fabrica* (fig. 1b), where the dissector and demonstrator are relegated to hiding under the dissection table, while he, the professor, moved center stage conducting the dissection, performing the demonstration and lecturing all at once. In so doing, Vesalius directly challenged the idols of anatomical science and

V \$ N 171! i, I

€v»« HUVJtEßlí,

Fig. 1. Frontispieces of Mondino's *Anatomy* (a), Vesalius' *Fabrica* (b), and Colombo's *De ReAnatomica* (c).

262

Am JNephrol 1997;17:261-268

Eknoyan/De Santo

expounded on the errors recorded in the texts of the ancients that had been perpetuated by his predecessors [8, 9]. In dissecting the corpse, Mondino de Luzzi (1276-1326) and Berengario de Carpi (1480-1550) had written on their own direct observations, but neither had placed anatomy on the sound basis that Vesalius did [5]. Thus, while the *Fabrica* will always be a milestone in the history of scientific illustration, the more fundamental contribution of Vesalius was his insistence that anatomical description of humans be based on the direct examination of human cadavers. In doing so, he freed the science of anatomy from the constraints of past ages, and rendered the human body a fit subject for scientific exploration.

Life and Relation with Vesalius

A recounting of these facts is important not only to highlight the important contributions of Vesalius, but because they provide his link to Colombo and offer insight into the personalities

and egos of these two powerful and driven contemporaries (table 1). This can be appreciated from a comparison of the frontispiece of their respective books (fig. 1b, c). Both are shown at the dissection table conducting the procedure themselves while teaching. However, the crowded (about 80 figures, several of them engaged in various side activities) and theatrical frontispiece of the text of Vesalius, shown looking at no one in particular but gazing in the netherland, stands in sharp contrast to that of the frontispiece of Colombo with its more modest audience (12 figures, all looking at or pointing to the cadaver) and Colombo staring almost directly at an imaginary viewer in the stands above him. A more direct link that the Vesalius frontispiece provides is not only because Colombo is thought to be portrayed in the audience but because of its relevance to their respective backgrounds. Oddly, both were the sons of apothecaries. Vesalius' father was druggist to Charles V while that of Colombo to a mere Venetian surgeon. The aristocratic roots of Vesalius reflected not only in his gaze but also in his clothes stand again in sharp contrast to the simpler pose and clothes of Colombo (fig. 1b, c).

Born in Cremona, about 1516 (1515-1517), Colombo moved to Venice with his father who became druggist to Giovanni Antonio Lonigo, a surgeon in Venice and dissector to Paolo Colombo, a relative of Realdo Colombo [9, 10] who occupied the Chair of Anatomy at Padua as the immediate predecessor of Vesalius (table 1). As such, in attacking the teaching methods of his predecessors, Vesalius was by extension and more directly attacking a prominent relative (Paolo Colombo) and personal teacher (Giovanni Antonio Lonigo) of Realdo Colombo. The pertinence of these associations is relevant to an understanding of Colombo, who, having completed his studies in liberal arts in Milan, began to study surgery with Lonigo when his father moved to Venice (table 2). He refers fondly to his 7-year association with Lonigo in the introduction of his *De Re Anatomica*, referring to him as 'Ioanni Antonio PLATO, known as Lonigo,' Plato being an acronym Lonigo had

Table 1. Padua – 'Eplicatores Chirurgiae'

1520 Pietro Mainardi of Verona
 1523 Giambattista Pigafeta of Vincenzo
 Jeronimo Vails of Spain
 Nicolo Musico of Padua
 1530 Giambattista Lombardi of Padua
 1535 Francesco Litigato of Lendinara
 Marcantino Montagnana of Padua
 Paolo Colombo of Cremona
 Andreas Vesalius of Brussels

1544 Realdo Colombo of Cremona

Table 2. Realdo Colombo (1516-1559)

Life

1515-1517? born, Cremona

1559 died, Rome

Studies

c. 1529 liberal arts, Milan

c. 1533 surgery, Venice

1540 medicine, Padua

Tenures

lecturer in philosophy, Padua

assistant to Vesalius assigned/denied second Chair of

Surgery

temporary assignment, Padua

permanent, assignment, Padua

professor, Pisa

1548 professor, Rome (Sapienza)

Publication of *De Re Anatomica* Began 1542?

Finished 1556-1558

Published 1559, Venice Translated 1578 (English) 1609 (German)

acquired for his habit of referring to Plato in his lectures. More intimate and touching, reference to Lonigo is made in his chapter on the muscles of the scalp: 'On many occasions I delightedly watched the head of my teacher IOANNIS ANTONII PLA-TI, who was able to move his whole scalp back and forth ... but now I am the one whose scalp can easily be seen to move since I am bald, although my skin is without dryness and is soft and lax like the skin of a newborn infant' [11]. His own baldness, illustrated in the frontispiece of *De Re Anatomica* (fig. 1c), as well as his portrait in the Hall of the Faculty of Medicine at the University of Padua (fig. 2) may be pertinent to identifying him in the frontispiece of Vesalius' *Fabrica* (fig. 1b). Initially said to be the bearded man standing on the right of the frontispiece staring at the dog stepping on his foot [8], O'Malley subsequently identifies this figure as that of the Paduan philosopher, Marcantonio Genua, without further mention of Colombo as being in the picture [9]. While one can only speculate on such matters, the only bald person in the Vesalius frontispiece is the man

Realdo Colombo

AmJNephrol 1997;17:261-268

263

Fig. 2. Portrait of Realdo Colombo (1516– 1559) in the Hall of Medicine, University of Padua. in the third row, one person removed to the right of the skeleton, listening to the person to his left whispering in his left ear. If this is correct, then his position balances that of the artist credited with illustrating *Fabrica*, Jan Stefan van Calcar (1499– 1546), on the left of the skeleton with an open book in his hand.

His fondness for Antonio Lonigo and his family ties to Paolo Colombo notwithstanding, a sense of Colombo's actual convictions and scientific instincts can be appreciated from his decision to abandon the practice of surgery, for which Lonigo had trained him, to pursue the study of medicine in Padua. There he became a lecturer in philosophy and student of anatomy alongside John Caius (1510-1573), after whom Caius College in Oxford is named. But his principal commitment to anatomy and acknowledged surgical skills are evident from Vesalius' choice of him as his prosector. He was appointed by the University as assistant to Vesalius in 1541, after having applied for the Second Chair of Surgery that was granted him by the university authorities but denied by the Senate of Venice, the ruling body of the University of Padua, which elected to grant both chairs of surgery to Vesalius. When Vesalius left Padua in 1542, to publish *Fabrica* and to seek a position in the court of the Holy Roman Emperor Charles V (1500-1558), Colombo assumed his teaching responsibilities. When Vesalius prolonged his departure, Colombo was given temporary assignment of the Chair of Anatomy in 1543. After Vesalius obtained the court assignment, Colombo was promoted to the permanent position, with an accompanying increase in his salary from 20 to 80 florins per year, as compared to the 200

florins Vesalius had received [1, 5, 9, 10]. The difference in salary for the same academic position is but one measure of the esteem that Vesalius was held by his peers and the school administration. Still, the fact that Colombo was asked to fill in for Vesalius and then given the chair reflects on his own well-recognized ability as a teacher and aptitudes as an anatomist.

Another aspect of their relationship is the competitive spirit to primacy in discovery, which was to spoil what had been a warm and apparently intimate teacher-pupil relationship. Upon his brief return to Padua in 1542, Vesalius is said to have been irked by Colombo's criticism of some of his teachings. Where in the first edition of the *Fabrica* he had referred to Colombo as 'my friend Colombo, skilled professor at Padua, most studious of anatomy', he now bitterly attacked Colombo, removed all mention of him from the second edition of *Fabrica*, and in his 1546 'Letter on the China Root' refers to Colombo as one

... who learned something of anatomy by assisting me in my work, although he was incompletely educated; several times he had heard in the medical school that I was unable to find a passage or vein – actually a fiction of most anatomists – and while I was absent from Padua he dissected a body and boasted that he found something that was unknown to me' [9, 10].

For his criticism of Vesalius, Colombo has been faulted, probably wrongly, by subsequent authors [9, 11-13]. It is easy to conceive how, at a time of intense research and discovery, what may have been correctly described one day by one investigator may be shown to be wrong the following day by the another investigator. As such it is not unexpected that during the course of dissection, Colombo, in his pursuit of anatomical accuracy, would have pointed to the errors of several others, including those of Vesalius. This was the very essence of the method Vesalius had promulgated, and something he had done himself to his own predecessors and contemporaries. Thus, the ire of Vesalius was probably more one of a bruised ego, especially that of a teacher criticized by his own pupil. After all, without in any way detracting from his own milestone contributions, Vesalius was indeed wrong in many of his descriptions, not least his description and illustration of the kidney.

Contributions to Nephrology, the Circulation and Morbid Anatomy

Vesalius, like all his predecessors and in keeping with the writings of Galen, whom he criticized, places and illustrates the right kidney higher than the left [8, 9]. By contrast, Colombo, by direct observation, corrects this error for what may be the first time in history when he writes:

The kidneys are two in number, a right one and a left one, each joining the back and false ribs. It is very interesting that GALEN worked anxiously hard and long in search for the reason for which Nature placed the right kidney in a superior position to the left one so that the right kidney is set higher than the left one. But with an over scrupulous, not to say useless, examination our GALEN carried out this investigation that by using a different way, through direct observation, he would immediately and very easily have been able to observe the contrary of that [11].

264

Am JNephrol 1997;17:261-268

Eknoyan/De Santo

For this singular contribution, which corrects an error that had been perpetuated for centuries, Colombo clearly deserves a place in the history of nephrology.

By far the more important contribution of Colombo is his description of the pulmonary circulation [10, 13]. In his chapter on the heart and arteries he writes

Between these ventricles there is a septum through which most everyone believes there opens a pathway for the blood from the right ventricle to the left, and that the blood is rendered thin so that this may be done more easily for the generation of vital spirits. But they are in great error, for the blood is carried through the pulmonary artery to the lung and is there attenuated; then it is carried, along with air, through the pulmonary vein to the left ventricle of the heart. Hitherto no one has noticed or left in writing, and it especially should be observed by all [11].

This has been characterized as the best description of the pulmonary circulation before William Harvey's (1578-1657) epochal *Exercitatio Anatomica de Motu Cordis et Sanguinis*, published in Frankfurt in 1628 [14]. Harvey duly acknowledged Colombo for his observations.

Compare this with the description of Vesalius in the first edition of *Fabrica*, published in 1543: '... the blood soaks plentifully through the septum from the right ventricle to the left...' A clear endorsement of the Galenic view of the pulmonary circulation, which he reluctantly and with obvious hesitation attempts to correct in the 1555 edition of *Fabrica*, where he writes: '... the blood is thought to soak plentifully through... I still do not see how even the smallest quantity of blood can be transfused through the substance of the septum, from the right to the left.'

A lukewarm attempt to question but one that fails to correct the error.

Colombo's more accurate observation of the relative position of the two kidneys and his important contributions to the pulmonary circulation speak for themselves. That what may have been a slight error by Vesalius had been highlighted by Colombo in the course of his lectures is a reality of life that one has to accept in dealing with scientific truth. That it rubbed Vesalius the wrong way is merely the reaction of a hurt but obviously big ego. It is unfortunate that the due respect Vesalius has been granted for the *Fabrica* has lent an undue mantle of credibility to his criticism of Colombo, as a result of which the latter's contributions have been denied the credit they deserve [12, 13].

One measure of the contributions of any past figures is to examine the recognition they received from their peers. If this is any measure of success, then the plucking away of Colombo by Cosimo de Medici to teach in Pisa and then granting him permission to go to Rome, where he became physician to popes and cardinals, can be considered sufficient recognition. For after a short stint in Pisa, Colombo moved to Rome, where in 1548 he was appointed a professor at Sapienza (table 2), in the process achieving his goal of becoming physician to the mighty and powerful [9, 10]. It is important to note in this regard that he became trusted enough by the Vatican to have been asked to

perform the autopsy of several princes of the Church. These he describes in the concluding chapter of *De Re Anatomica*, titled 'On Those Things Rarely Found in Anatomy,' as a letter to one Iacobe Bone (Jacopo Boni, died 1587), a physician and apparently a friend [11,15]. The importance of this brief addendum is not only the description of the autopsy findings of prominent figures, but because it marks the beginnings of morbid anatomy that was to form the basis of many of the advances in medicine during the ensuing century. For having accurately established normal anatomy, medicine was now ready to embark on identifying the changes caused by disease. To his credit, Colombo was insightful enough to have taken some of the initial steps in that direction by describing diseased organs in his book.

In the body of the letter he describes abnormalities of the kidney, including that of a horseshoe kidney and, importantly, that of Ignatius Loyola, founder of the Society of Jesus (Jesuit) order: 'With these my hands have extracted numerous calculi of various colors found in the kidneys, in the lungs, in the liver, in the portal vein, as you Jacopo Boni have seen with your own eyes, in

the Venerable Ignatius, founder of the Congregation of Jesus, in whom I saw the stones in the ureters, in the bladder ...[11].

Another measure of success is the universal acceptance of the work of any author. For all its fame, the *Fabrica* was too expensive for everyone to afford and was in the main an atlas of anatomy. *De Re Anatomica*, on the other hand, came to be widely used as a textbook of anatomy, being translated into English in 1578 and German in 1609. This is best documented in an 1831 painting in the Bridgeman Art Library at the University of Glasgow showing John Banister (1533-1610) lecturing on anatomy [16]. The prominently displayed text from which he is reading is none other than Colombo's *De Re Anatomica* (fig. 3).

Relation to Michelangelo

Equally deserving of consideration is Colombo's desire to move to and work in Rome. While his motives may have been many, including that of access to the court of the Vatican, it is obvious that he had a principal and, perhaps, greater motivation: to have Michelangelo illustrate the anatomy book he had been working on since 1542. For artistic reasons, and much like his contemporaries, Michelangelo (1475-1564), had had a longstanding interest in anatomy. He is said to have had visions of publishing a book on anatomy, but never had the time, patience and perseverance to do so. Like his rival in fame Leonardo da Vinci (1452-1519), whose notebooks on anatomy survive as a much cherished treasure of the period, Michelangelo had been a student and illustrator of anatomy. He certainly dissected and demonstrated anatomy to his apprentices [17-21]. He is also known to have befriended Colombo, who provided him with cadavers for dissection and became his personal physician. In *The Lives of the Artists*, Giorgio Vasari [1511-1574] records their relationship:

Realdo Colombo

AmJNephrol 1997;17:261-268

265

Fig. 3. Portrait of John Banister (1533-1610) giving the Visceral Lecture to the Barber Surgeons in 1581 (a), with a magnification (b) showing the book he is reading from – *De Re Anatomica*. ... in his old age he (Michelangelo) suffered from gravel in his urine which finally turned into kidney stones, and for many years he was in the hands of Master Realdo Colombo, his very close friend, who treated him with injections and looked after him carefully [22].

A fact acknowledged by Michelangelo in his March 23, 1549 letter to his nephew Lionardo di Buonarroto Simoni:

Since then, having been given a certain kind of water to drink, it has caused me to discharge so much thick white matter in the urine, together with some fragments of the stone, that I am much better and they hope in a short time I shall be free of it – thanks to God and to some good soul.

Better insight into Michelangelo's anatomical interests can be gleaned from the following summary by Ascanio Condovi in his *Life of Michelangelo* [19]:

Now, to return to the subject of anatomy, he gave up dissecting corpses because his long handling of them had so affected his stomach that he could neither eat nor drink salutarily. It is quite true that when he gave it up he was so learned and rich in knowledge of that science that he has often had in mind to write a treatise, as a service to those who want to work in sculpture and painting, on all manner of human movements and appearances and on the bone structure, with a brilliant theory which he arrived at through long experience. He would have done it had he not

doubted his powers and whether they were adequate to treat the subject properly and in detail, as someone would who was trained in the sciences and in exposition. I know very well that, when he reads Albrecht Durer, he finds his work very weak, seeing in his mind how much more beautiful and useful in the study of this subject his own conception would have been. And, to tell the truth, Albrecht discusses only the proportions and varieties of human bodies, for which no fixed rule can be given, and he forms his figures straight upright like poles; as to what was more important, the movements and gestures of human beings, he says not a word. And, because by now Michelangelo has attained a grave and mature age and does not expect to be able to reveal this invention of his to the world in writing, he has disclosed everything to me with great devotion and in the most minute detail. He also began to discuss this with Master Realdo Colombo, a very superior anatomist and surgeon and a particular friend of Michelangelo's and mine, who sent him for this purpose the corpse of a Moor, a most handsome young man and, insofar as one could say, most suitable; and it was placed in S. Agata where I was and still am living, because of its being a remote place. On this corpse Michelangelo showed me many rare and recondite things, perhaps never before understood, all of which I noted and hope one day to publish with the help of some learned man for the convenience and use of all who want to work in painting and sculpture. But enough of this.

That Colombo shared this notion and schemed to collaborate with Michelangelo on a book is shown in a 1548 letter he wrote to his patron Cosimo de Medici asking permission not to return to teach in Pisa but to stay in Rome to work on his book, because among other advantages (more corpses) Rome offered: '... fortune has presented me with the greatest painter in the world to assist me in this' [10]. Unfortunately, by the time Colombo reached Michelangelo, the latter was 72 years old, engrossed in many unfinished projects, seems to have lost his fervor to publish a text on anatomy and to have destroyed his anatomical notes. A regrettable eventuality for it deprived the world of what might have been not only a major anatomic text but an important artistic contribution. Had Michelangelo gone on to illustrate Colombo's text there is no doubt that the fortunes of Vesalius and Colombo, and their place in the history of medicine, would have been reversed.

Michelangelo's interest in anatomy is perhaps best reflected in his painting *The Last Judgement* (fig. 4). Prominently dis-

266

Am JNephrol 1997;17:261-268

Eknoyan/De Santo

Fig. 4. Portrait of Saint Bartholomew by Michelangelo. Detail from *The Last Judgement*, Sistine Chapel, Rome.

Fig. 5. The muscle man holding his skin by Gaspar Becerra in Juan Valverde de Hamusco's *Historia de la Composicion del Cuorpo Humano*, 1556.

played to the left of Jesus is Saint Bartholomew, balancing the position of Saint Peter on the right. Why this focus on an otherwise obscure disciple who had been relegated to the shadows by other painters? The message probably is in the flayed skin Bartholomew holds in his left hand

and the knife used in his right. That the face on the flayed skin is that of Michelangelo only reinforces the message. For Bartholomew having become the saint of tanners and butchers seems to have been adopted by artists, still scrounging for acceptance and blessing for the dissection of cadavers. Permission to dissect corpses, provided that the dissected bodies were given decent burial, had been granted by Pope Sixtus IV (1471-1484), who had been a student at the Medical School of Bologna [5, 23-25]. Still, corpses were rare and the notion resisted. Having the patronage of a saint was a plus that was apparently also sought by anatomists. It is of interest in this regard that the eminent Spanish pupil of Colombo, Juan de Valverde de Hamusco (1515-1565), who

accompanied him to Pisa and Rome when Colombo left Padua, published on his return to Spain an illustrated text on anatomy [26]. In the text he provides a description of the study of anatomy close to the practice of the time:

The truth of this has been shown in our time by Michelangelo florentino and Pedro de Rubiales extremeño who having given themselves at once to anatomy and painting, have come to be the most excellent and famous painters that have been seen for a long time [27].

The illustrations of Valverde's *Historia de la Composicion del Cuorpo Humano* were done by a Spanish artist, Gaspar Bacerra (1500-1570), who had worked in the studio of Michelangelo. His rendering of the muscle man shown as a flayed body holding the skin in one hand and a blade in the other (fig. 5), was to become a pose used in the frontispiece of several subsequent texts of anatomy [28-30]. Its similarity to Michelangelo's portrait of Bartholomew is striking (fig. 4, 5).

Realdo Colombo

Am J Nephrol 1997;17:261-268 267

Deserving additional consideration in this regard is the rendering by Raphael (1483-1520) of Apollo and Marsyas in *The Stanza della Signatura* adjoining the Sistine Chapel. Apollo, seated on a throne, is shown watching Marsyas receiving punishment by being flayed for losing his challenge to Apollo, the Greek deity of medicine and the alleged father of Asklepios. That both Michelangelo and Raphael should have adorned the Vatican with images related to dissection cannot be mere chance.

Artists and Anatomists

The art of the Renaissance, not satisfied with copying the nudes of antiquity, had pushed its contributors into dissection to better reproduce the body [23-25]. Over the years, the traditional course of instruction for aspiring artists included a concentrated study of the human figure, not only in its external features, but also in the grounding structure of the skeleton and musculature. In Florence, the Academy of Art was the first to institute an obligatory course in anatomy, in which Raphael, amongst others, had copied cadavers and skeletons. From the beginning, an association between artists and anatomists existed. Where the interest of artists was limited to the musculo-

skeletal system, that of physicians extended to the internal organs as well. The symbiosis and dialogue that developed between the two served the purposes of both disciplines and provided room to collaborate and cross-fertilize. Thus, Leonardo is said to have collaborated with Marcantonio della Torre (1481-1512), a physician and anatomist at the Medical School in Pavia, for several years during his second period in Milan (1506-1513). The project came to an end when della Torre died, but Leonardo preserved his notes. Unfortunately, his admirable renderings of the internal organs were not available to medicine and went unpublished until the 19th century. Michelangelo, who ventured into dissection and had similar aspirations, is said to

have burned his notes, only a few of which have survived [17, 21]. That he may have elected to even consider collaborating with Colombo on *De Re Anatomica* is but a final measure of the credit that Colombo rightly deserves.

Acknowledgements

The authors wish to thank Gilda Virzo and Leonardo Gallo for their careful translation of the various passages from *De Re Anatomica*, Carmela Bisaccia for providing bibliographical material, the librarians at Biblioteca Nazionale di Napoli for their literature search, and Charlia Due for assistance in preparing the manuscript.

10

References

- Tosoni P: *Della Anatomia degli Antichi e della Scuola Anatomica Padavona-Pado*. Dalla Tipogr de Seminario, 1844.
- Quirico T (ed): *Les Siecles D'or de la Medecine. Padoue XVe-XVIIIe Siecles*. Milan, Electa, 1989.
- Rossetti L: *The University of Padua: An Outline of its History*. Trieste, Lint, 1983.
- Dempster WT: European anatomy before Vesal-ius. *Ann Med Hist (New Ser)* 1943-6-307-319 448-491.
- Singer C: *Beginnings of Academic Practical Anatomy in History and Bibliography of Anatomic Illustration by Ludwig Choulant*. New York Hafner 1952.
- Bylebyl JJ: Interpreting the Fasciculo anatomy scene. *J Hist Med Allied Sci* 1990;45:285-316.
- Eknayan G: The Origins of nephrology – Galen, the founding father of experimental renal physiology. *Am J Nephrol* 1989;9:66-82.
- Saunders JB, Saunders CM, O'Malley CD: *The Illustrations from the Works of Andreas Vessalius of Brussels*. New York, World Publishing, 1950.
- O'Malley CD: *Andreas Vesalius of Brussels 1514– 1564*. Berkeley, University of California Press, 1964.
- Coppola ED: The discovery of the pulmonary circulation: A new approach *Bull Hist Med* 1957-31-44-77.
- Realdi Columbi Cremonensis: *De Re Anatomic Li-bri XV*. Venetiis, Ex Typographia Nicolai Beuilac-quae, 1559.
- Foster M: *Lectures on the History of Physiology During the Sixteenth, Seventeenth and Eighteenth Centuries*. Cambridge, Cambridge University Press, 1924.
- Wilson LG: The problem of the discovery of the pulmonary circulation. *J Hist Med Allied Sci* 1962; 17:229-244.
- Lambert SW: A reading from Vesalius and the physiology of Vesalius. *Bull NY Acad Med* 1936; 12:345-415.
- Moes RJ, O'Malley CD: Realdo Colombo 'On Those Things Rarely Found in Anatomy' – An annotated translation from *De Re Anatomica* (1559). *Bull Hist Med* 1960;34:508-528.
- Lett H: Anatomy at the Barber Surgeon's Hall. *Br J Surg* 1943;31:101-111.
- Schmidt H, Schadewaldt H: *Michelangelo und die Medizin seiner Zeit*. Stuttgart, Schattauer, 1965.
- Beck J: *Michelangelo: A Lesson in Anatomy*. New York, Viking, 1975.
- Condivi A: *The Life of Michelangelo* (Wohl AS, trans). Baton Rouge, Louisiana State University Press, 1976.

Liebert RS: Michelangelo: A Psychoanalytic Study of his Life and Images. New Haven, Yale University Press, 1983.

Elkins J: Michelangelo and the human form: His knowledge and use of anatomy. *Art Hist* 1984;7: 176-186.

Vasari G: The Lives of the Artists. Oxford, Oxford University Press, 1991.

Schultz B: Art and Anatomy in Renaissance Italy. Ann Arbor, UMI Research Press, 1982.

Mayor AH: Artists and Anatomists. New York, The Metropolitan Museum of Art, 1984.

Kennedy BP: Artists and Anatomists; in *The Anatomy Lesson: Art and Medicine*. Dublin, The National Gallery of Ireland, 1992.

Guerra F: Juan de Valverde de Amusco: Evidence for the identification of his portrait claimed to be that of Vesalius – With a reappraisal of his work. *Clio Med* 1967;2:339-362.

Summers D: Michelangelo and the Language of Art. New Jersey, Princeton University Press, 1981.

Cushing H: Ercole Lelli and his écorché. *Yale J Biol Med* 1936-1937;9:199-213.

Meyer AW, Wirt SK: The Amuscan illustrations. *Bull Hist Med* 1943;14:667-687.

Szladits LL: The influence of Michelangelo on some anatomical illustrations. *J Hist Med Allied Sci* 1954;9:420-427.

268

Am J Nephrol 1997;17:261-268

Eknoyan/De Santo