

## Historical Perspective Carl Nicoladoni and His Contributions to Scoliosis

Raffi Guranluoglu, M.D., Georg M. Huemer, M.D., Maziar Shafiqi, M.D., Aslin Guranluoglu, B.S., and  
Hildegunde Piza-Katzer, M.D.

Carl Nicoladoni (1847-1902) studied medicine in Vienna and became Privatdozent in surgery in 1876. He accepted a chair as a Professor of Surgery at the university clinics of Innsbruck (1881) and Graz (1895). Nicoladoni has made significant contributions in the progress of surgery and performed a variety of operations in several surgical disciplines. However, his principal contributions are in the field of orthopedic surgery, in particular his excellent and detailed studies on scoliosis, based on thorough anatomic and kinetic investigation. His commitment to the research of scoliosis resulted in three books and three bigger treatises, all of which were printed in German. His earliest book was printed in 1882 and was on the torsion of the scoliotic spine, *Die Torsion der Skolioischen Wirbelsäule*. Three bigger treatises on scoliosis entitled *Die Architektur der Skolioischen Wirbelsäule* (The Architecture of the Scoliotic Spine, 1889), *Die Architektur der Kindlichen Skoliose* (The Architecture of Juvenile Scoliosis, 1894), and *Die Skoliose des Lendensegmentes* (The Scoliosis of Lumbar Segments, 1894) were published in an anthology called *Denkschriften der Kaiserlichen Akademie der Wissenschaften*, a series of publications from the imperial academy of science. Two versions of his epical work, *Anatomie und Mechanismus der Skoliose* (Anatomy and Mechanism of Scoliosis) were printed. A larger edition printed in 1904 was part of the *Bibliotheca Medica*, a monumental series of various clinical books published around the beginning of the past century. The second version, a shortened one, with the same title was included in an anthology called *Deutsche Chirurgie* (German Surgery) and published in 1909. The purpose of this historical article is to discuss Nicoladoni's achievements in the field of scoliosis based on a detailed analysis of his books. [Key words: Carl Nicoladoni, medical history, scoliosis, anatomy, surgery] *Spine* 2003;28:2426-2431

Paris, the unquestioned leader of world medicine during the first half of the nineteenth century, continued to hold this position, although she was beginning to share it with others. While Paris was still the "Mecca" of medicine, signs of new activity became apparent in Vienna, where the traditions of the old Vienna School had not entirely

died out. The embers were fanned into flame by the activity of three remarkable men, Rokitsansky (1804-1878), Skoda (1805-1881), and Hebra (1816-1880), who became the nucleus of a group since designated as the New Vienna School, who raised Vienna once more to the position of a great medical center. The leading spirits of the New Vienna School drew other young men to Vienna. Among them were Hyrtl, Billroth, Toldt, Tandler, Zuckerkandl, Wenkebach, von Pirquet, and Nicoladoni, who continued their traditions of accuracy, industry, and honesty throughout the century.<sup>7</sup> Of these industrious medical personalities, little attention has been paid to Carl Nicoladoni, who contributed significantly to the progress of surgery and in the field of scoliosis. The purpose of the present publication is to acquaint the reader with Carl Nicoladoni and to emphasize his role and achievements in the field of scoliosis.

### ■ Nicoladoni's Biography

Nicoladoni's parents, from the rural region of Lago Maggiore in Italy, moved to Vienna in Maria Theresian times. Carl Nicoladoni was born on April 23, 1847 in Vienna (Fig. 1). He studied medicine in Vienna and graduated in 1871. As a student, he focused on anatomy and was influenced by the powerful personality of the famous anatomist, Joseph Hyrtl (1810-1894).<sup>3,6</sup> Nicoladoni, through imperishable deeds of his mind and skillful hand, belongs to those illustrious personalities, who were responsible for the rise of modern German surgery.<sup>34</sup> -Theodor Billroth (1829-1894)

One year after his graduation, Nicoladoni joined the first Surgical University Clinic of the General Hospital (*Allgemeines Krankenhaus*) in Vienna. There he was taught by the surgeon von Dumreicher, who had an immediate impact on Nicoladoni's future medical career. When Eduard Albert (1841-1909),<sup>2</sup> a member of von Dumreicher's team, was appointed to the surgical chair at the University of Innsbruck in 1872, Nicoladoni became chief resident. During that time he was heavily involved in surgical practice and thus was able to gain experience and increase his surgical skillfulness. Apart from his clinical occupation, he dedicated much of his time in teaching and scientific research. In 1876, Nicoladoni became a Privatdozent of surgery.<sup>34</sup>

The continuing rise of the neighboring second surgical clinic under the brilliant Theodor Billroth (1829-1894) had an impact on the young surgeon, and there was a vivid correspondence between him and the pupils of Billroth. He felt strongly attracted to the innovative devel-

The Department of Plastic and Reconstructive Surgery and the Ludwig-Boltzmann Institute for Quality Control in Plastic and Reconstructive Surgery, Leopold-Franzens University, Innsbruck, Austria.  
Acknowledgment date: September 24, 2002. Acceptance date: October 29, 2002.

The manuscript submitted does not contain information about medical device(s)/drug(s). No funds were received in support of this work. No benefits in any form have been or will be received from a commercial party related directly or indirectly to the subject of this manuscript.  
Address reprint requests to Raffi Guranluoglu, M.D., Department of Plastic and Reconstructive Surgery, Leopold-Franzens University, Anichstrasse 35, A-6020 Innsbruck, Austria; e-mail: Raffi.Guranluoglu@uibk.ac.at



Fig. 1. Carl Nicoladoni. Reprinted from Nicoladoni C. *Anatomie und Mechanismus der Skoliose*. Berlin: Urban & Schwarzenberg; 1909.

opments and participated whenever possible. Hence, Nicoladoni was able to take part in many of the new developments that Billroth's school was famous for. He was instrumental in the development of the first gastroenterostomy, which was performed by Anton Wölfler in Billroth's clinic. However, Nicoladoni never gave up his loyalty to his old teacher von Dumreicher, who represented the old surgical approach.

In the year 1880, Nicoladoni replaced his chief von Dumreicher because of his illness. The death of his surgical mentor was a turning point in Nicoladoni's academic career. When Eduard Albert, a pioneer of orthopedic surgery and teacher to the famous Adolf Lorenz (1854–1946),<sup>2</sup> was appointed as chief and became successor of von Dumreicher in Vienna, Nicoladoni accepted a chair in Albert's place in Innsbruck in 1881.<sup>34</sup>

The small town in the Alps did not provide him with the luxury and materialistic offers of the capital town but gave him the high satisfaction of being a clinical teacher. It was his fate to stay in Innsbruck for almost 14 and one-half years. During that time, he performed numerous innovative surgical procedures, including the reconstruction of a thumb using a tubed pedicle flap from thorax.<sup>4,9,33</sup>

After rejecting an invitation to the surgical clinic in Prague, Nicoladoni became Professor of Surgery at the

university clinic in Graz in 1895. The Styrian capital offered a much broader clinical spectrum and better academic aids to develop a prospering medical school. Unfortunately, Nicoladoni's state of health started to deteriorate after a serious attack of influenza. Because of this illness, he had to suspend his beloved clinical work for the first time in his life. It was his iron willpower and strong constitution that fought back this uninvited guest. Nicoladoni stayed for 7 years in Graz and died of a sudden heart attack during the night of December 3–4, 1902 at the age of 55.

During his professorship, Nicoladoni educated numerous well-known surgeons, such as Erwin Payr.<sup>5,8,35</sup> Erwin Payr, who became Professor of Surgery at Graz, Greifswald, Königsberg and then at Leipzig in 1911, was an excellent and learned surgeon, making contributions to many surgical subjects, notably on disease of the joints, surgery of the abdominal organs, breast, and thyroid gland.

#### **Nicoladoni's Books on Scoliosis**

Nicoladoni's main contributions are in the field of orthopedic surgery, particularly his excellent and detailed studies on scoliosis based on thorough anatomic and kinetic investigation. Nicoladoni's interest in scoliosis and its anatomy dates back during his residency training years. The first announcement about his work on scoliosis was made in 1881 at the 54th scientific meeting, *Naturforscherversammlung*, in Salzburg.<sup>10</sup>

His dedication to the investigation of scoliosis resulted in three books and three bigger treatises, all of which were printed in German. An original copy of each book is available at the Clinic Library of Leopold-Franzens University in Innsbruck. His earliest book was printed in 1882 and was on the torsion of the scoliotic spine, *Die Torsion der Skoliotischen Wirbelsäule*.<sup>11</sup> He completed this anatomic study when he was still head of the department of surgery in Innsbruck.

Three bigger treatises on scoliosis entitled *Die Architektur der Skoliotischen Wirbelsäule*<sup>12</sup> (The Architecture of the Scoliotic Spine, 1889), *Die Architektur der Kindlichen Skoliose*<sup>13</sup> (The Architecture of Juvenile Scoliosis, 1894), and *Die Skoliose des Lendensegmentes*<sup>14</sup> (The Scoliosis of Lumbar Segments, 1894) were published in an anthology called *Denkschriften der Kaiserlichen Akademie der Wissenschaften*, a series of publication from the imperial academy of science.

Two versions of his epical work entitled *Anatomie und Mechanismus der Skoliose* (Anatomy and Mechanism of Scoliosis) were printed. A bigger edition<sup>15</sup> printed in 1904 is part of the *Bibliotheca Medica*, a monumental series of various clinical books published around the beginning of the past century. Theodor Kocher (1841–1917) from Bern, Johann von Mikulicz (1850–1905) from Breslau, and Wilhelm Roux (1850–1924) from Halle were among the most prominent editors of this series of books (Fig. 2). The second version with the same title was a shortened one, with the inten-

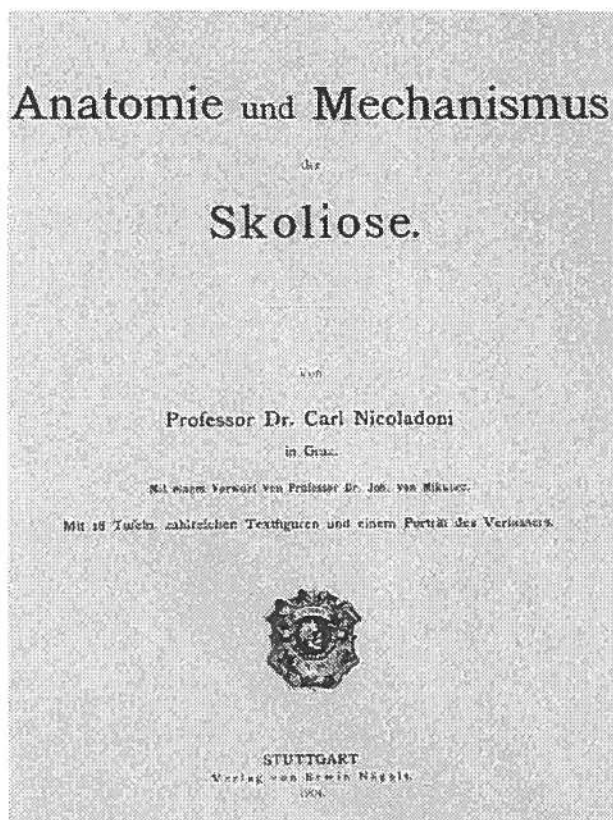


Fig. 2. The frontispiece of Nicoladoni's book entitled *Anatomie und Mechanismus der Skoliose*, which was published as part of *Bibliotheca Medica*. Reprinted from Nicoladoni C. *Anatomie und Mechanismus der Skoliose*. In: Kocher, König, von Mikulicz, eds. *Bibliotheca Medica*. Stuttgart: Verlag von Erwin Nagels; 1904.

tion to make it more easily available to a bigger readership. It was part of an anthology called *Deutsche Chirurgie*<sup>16</sup> (German Surgery) and published in 1909, 7 years after his death. Nicoladoni's books include many original figures and photographs, most of which were prepared and even drawn by him.

Examination of his books revealed that Nicoladoni described precisely the mechanism and the architecture of adult and juvenile scoliosis based on his thorough anatomic studies. His book *Anatomy and Mechanism of Scoliosis* includes several chapters on the mechanism of scoliosis, scoliotic spine in adults, architecture of scoliosis in children and adults, and scoliosis of the lumbar vertebra. Because this book represents the most recent synopsis of all his work on scoliosis, a brief review of this monumental treatise is provided here.

**Nicoladoni's Studies on Scoliosis**

Nicoladoni simply defined scoliosis as the lateral distortion of the human spine. He further differentiated it into a rachitic and a habitual scoliosis. He stated that the advanced habitual scoliotic spine had two main distortions that deviated from the median in an equal fashion. The first distortion on the level of the thoracic spine was more convex to the right side than the latter distortion in the lumbar segments, which was to the left side (Fig. 3).

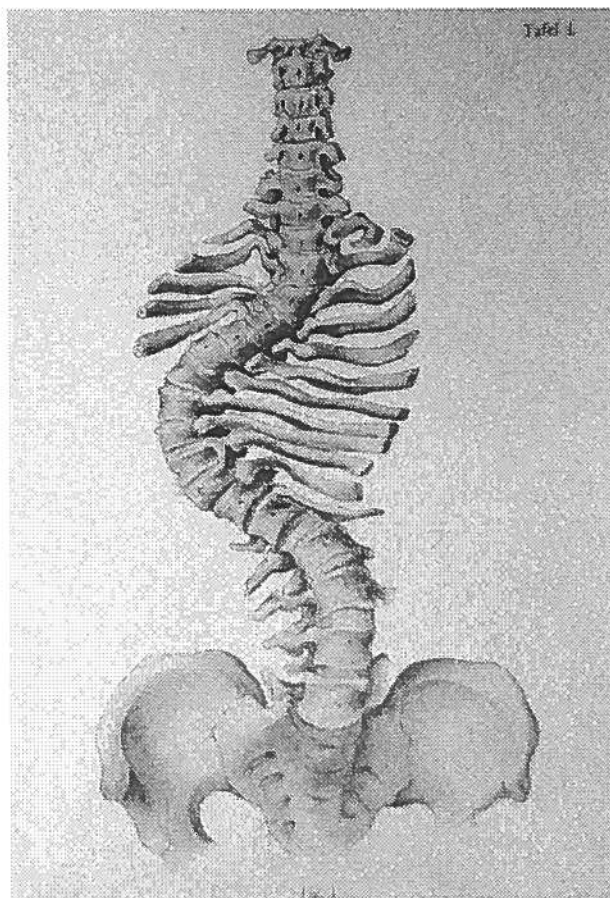


Fig. 3. The scoliotic spine drawn by Nicoladoni. Reprinted from Nicoladoni C. *Anatomie und Mechanismus der Skoliose*. Wien: Urban & Schwarzenberg; 1909.

He was concerned about the deformational and compensatory changes in the thoracic cage and internal organs caused by scoliosis. He stated that there was a direct correlation between the height of the thorax and the abdominal cavity and the diminished height of the spinal column caused by scoliosis. He wrote: ". . .With regard to the thorax he stated that the rib lowering is characteristic of the convex side, whereas the lifting is distinguishing for the concave side. . . The lowest rib bones will get in contact with the iliac crest, the abdomen becomes progressively broad whereas the diaphragm gets pushed into the thorax cavity. . .The right side of the thorax becomes narrowed, with that effect the right lung volume gets diminished and eventually obsolesces. . . The esophagus is not as curved as the spine. There is a buckling of the aorta. The heart is hypertrophied and dilated. The right kidney lies almost horizontally between the concavity of the lumbar segments and the posterior iliac crest and additionally the left kidney is remarkably bigger in size than the left one. . ."<sup>16</sup> (Fig. 4).

Nicoladoni also studied the ligaments of the scoliotic spine in a considerable detail. We quote here briefly his findings: ". . .The anterior spinal ligament descends from the tubercle of Atlas and divides into a thicker medial

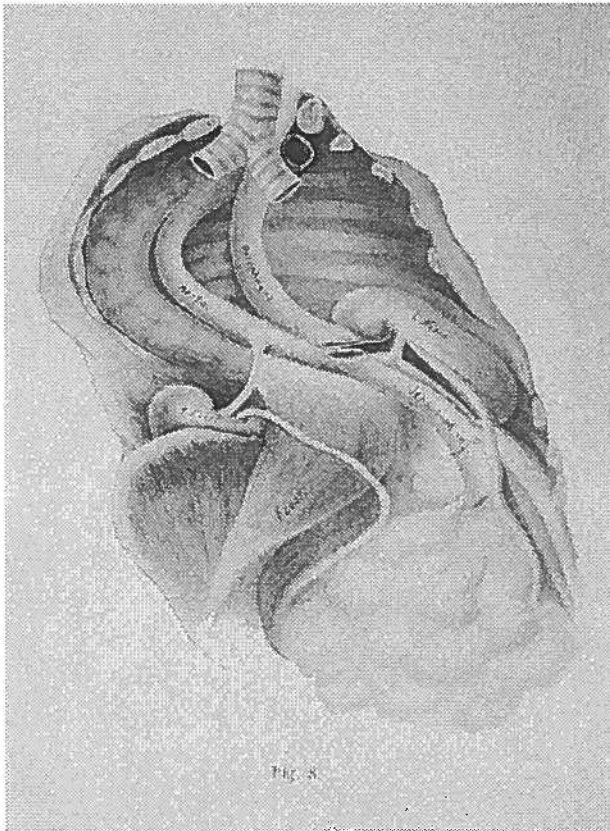


Fig. 4. This figure (drawn by Nicoladoni) demonstrates deformational changes in some internal organs associated with scoliosis. Note the buckling of the aorta and that the right kidney lies almost horizontally between the concavity of the lumbar segments and the posterior iliac crest. The left kidney is smaller than the right one, which is enlarged for compensation. Reprinted from Nicoladoni C. *Anatomie und Mechanismus der Skoliose*. Wien: Urban & Schwarzenberg; 1909.

part and two thinner flat lateral parts. It is tightly connected to the periosteum of the vertebral bodies. In scoliosis, the anterior spinal ligament's course of descent is over the concave side and a division into a medial and two lateral parts is not possible. On the convex side, remnants of a flat narrow ligament are seen. . ."; ". . .The posterior spinal ligament is similarly divided into a medial and two lateral parts. The medial division is connected tightly to the intervertebral discs over the entire spinal column. In scoliosis, the posterior ligament and the posterior emissary holes are shifted towards the convex side. . ."<sup>16</sup>

Nicoladoni explicitly discussed the mechanism of scoliosis. According to him, remodeling of the scoliotic vertebra was caused by unilateral overload. Hence, through compression at the concave side and distension and puffing of the bony framework on the convex side, the scoliotic curvature would result.

Nicoladoni focused on the biomechanics of scoliosis in great detail. According to his kinetic investigations, there was movement and change of form in most parts of the scoliotic spine. Solely, a small segment of the poste-

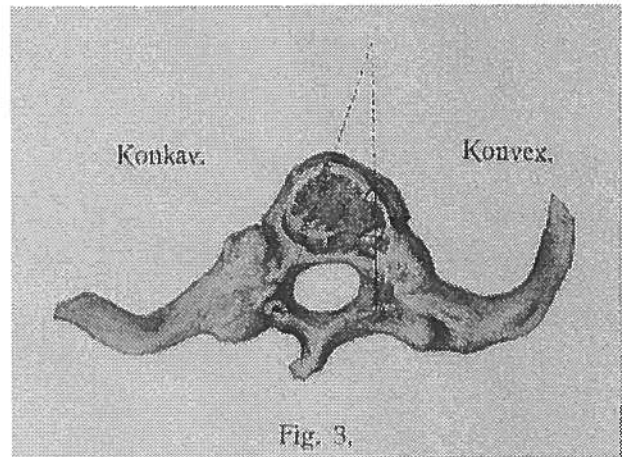


Fig. 5. A thoracic vertebra with rib segments viewed from above in a juvenile scoliosis (drawn by Nicoladoni). A,B: Interarticular segment. C,D: Epiphysial arch junction. Deviation of the vertebral axis demonstrated by the following measurements: A-C > C,D and C-E > D-F. The axis of vertebral body is tilted towards the convex side. Reprinted from Nicoladoni C. *Anatomie und Mechanismus der Skoliose*. Wien: Urban & Schwarzenberg; 1909.

rior vertebral arch lying between the origins of both articular processes was without motion. Nicoladoni called this part the interarticular segment (*segmentum interarticulare*). The part lying in front of this segment—the rest of the arch and the vertebral body—became elongated. Nicoladoni coined it the so-called horizontal torsion, which he used to describe the shift of the axis of the vertebral body towards the convex side, which was most prominent cranially and gradually declining caudally. Figure 5 is a sample that illustrates kinetic measurements performed by Nicoladoni to describe the deformational changes in a thoracic vertebra. In addition, the deformation in the vertebra included oblique orientation of the vertebral foramen and the tilt of the root of the arch on the concave side. The scoliotic spine became a rigid bony complex in which the center of gravity was shifted out of the median toward the origin of the arch on the concave side. Additionally, his findings demonstrated that the spinous processes did not show torsion corresponding to the vertebral bodies.

Nicoladoni was the first who described the anatomy of the juvenile scoliosis of habitual and rachitic origin. In horizontal sections of healthy juvenile vertebra, he described that if one drew a line connecting the basal parts of each articular processes with both epiphyseal junctures, then a regular trapezoid would result, whereas in the scoliotic juvenile vertebra a trapezoid would result, which was leaned against the convexity of the curvature. He believed that overall, the convex and concave regions of the spine had an equal amount of material but in an asymmetrical distribution.

Particularly attention-grabbing in this section is the study of the transverse and sagittal sections of vertebra at different levels of the juvenile scoliotic spine. He studied in great detail the integrity of bony structure and the

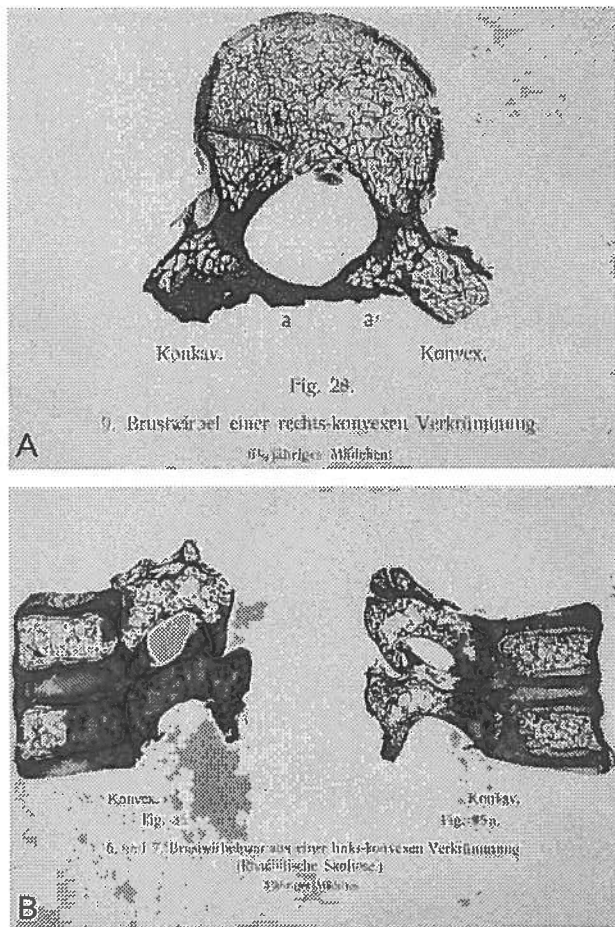


Fig. 6. **A:** Transverse section of ninth thoracic vertebra from right convex curvature in a 6.5-year-old female cadaver demonstrates the asymmetric distribution of the spongy bone in concave and convex parts. **B:** A sagittal section of a pair of thoracic vertebrae (sixth and seventh) from left convex curvature in a 6-year-old cadaver with rachitic scoliosis. The intervertebral disc and the nucleus pulposus have diminished in height on the concave side compared with that on convex side. Pictures reprinted from Nicoladoni C. *Anatomie und Mechanismus der Skoliose*. Wien: Urban & Schwarzenberg; 1909.

intervertebral disc in these sections. He demonstrated that the spongy bone of the vertebral body was asymmetrically distributed. It was composed of compact and dense spongy bone on the concave side, whereas the convex part had loosely structured spongy bone. The intervertebral disc and nucleus pulposus diminished in height on the concave side compared with that on convex side (Figs. 6A and 6B). Regarding the nucleus pulposus, Nicoladoni wrote: “. . .The nucleus pulposus of the intervertebral discs is only median in nonaffected vertebrae. In scoliosis, the nucleus leaves the median, is always asymmetric and is located laterally and anteriorly on the convex side. . .”.<sup>16</sup>

In his book, Nicoladoni also wrote a separate chapter on the scoliosis of lumbar segments, which he believed was an entity of its own. According to him, in the lumbar scoliosis there was only an inclination without a relevant

Die Skoliose ist eine Difformität, hervorgerufen durch exzentrische Belastung der Wirbelsäule, bei der es im Gefolge der seitlichen und reclinirten Abweichung immer zu einer Torsion kommt, welche einestheils in einer Rotationsbewegung der Einzelwirbel gegen die Konvexität der Verkrümmung, hauptsächlich aber in einer Ummodellung der Knochenmasse besteht, wodurch die Relationen der einzelnen Wirbelabschnitte zueinander in horizontaler, frontaler und sagittaler Ebene tief gestört werden und der Wirbel völlig asymmetrisch gestaltet wird.

Fig. 7. The original German text reprinted from Nicoladoni C. *Anatomie und Mechanismus der Skoliose*. Wien: Urban & Schwarzenberg; 1909:58.

reclination. Again, typically the interarticular segment was fixed in position, whereas all the other segments of the vertebra forming a group had deformational changes.

In his works, Nicoladoni also reviewed different theories about scoliosis from other anatomists, such as von Meyer’s treatise about the mechanics of scoliosis, *Die Mechanik der Skoliose*<sup>36</sup> or Eduard Albert’s work about the anatomy of scoliosis, *Zur Anatomie der Skoliose*,<sup>1</sup> and the work of Adolf Lorenz,<sup>2</sup> a leader of the Viennese school of orthopedics who is well known for his studies on flat foot, spondylitis, and scoliosis.

After looking through several opinions about the pathophysiology of scoliosis, Nicoladoni wrote a conclusive paragraph: “The scoliosis is a deformity caused by an eccentric overload of the spine, in which in the wake of the lateral and reclinated deviation, always a torsion will result, which on one hand consists of a rotational movement of the singular vertebra towards the convexity of the distortion, but moreover of a remodeling of the bony mass, which in turn causes disturbance of the relationship between all vertebral segments in a horizontal, frontal and sagittal plane and therefore, the vertebra totally asymmetrically develops”<sup>16</sup> (Fig. 7).

**Nicoladoni and Surgery**

In addition to his achievements in the field of scoliosis, Nicoladoni was also a competent and skillful surgeon. He performed a variety of operations in different surgical disciplines, but mainly in orthopedic surgery, and published his works in more than 50 publications. Although it is not the purpose of this historical article to recapitulate the entire surgical work of Nicoladoni, his accomplishments in various fields of surgery should briefly be reflected.

A major contribution to hand surgery was his thumb reconstruction using a tubed pedicle flap from the thoracic region. He even propagated hand-to-hand and foot-to-hand transfers.<sup>4,9,33</sup> Additionally, he is famous for his work on tendon transfers<sup>10</sup> and tendon sutures. The idea of transplanting the tendon of a healthy muscle to substitute for the lost function of a paralyzed muscle was first proposed in 1881 by Nicoladoni.<sup>2,10</sup>

Besides his interest in scoliosis, he pursued other orthopedic topics like pes equinus paralyticus,<sup>17</sup> methods for the treatment of pseudarthrosis<sup>18</sup> or old luxations,<sup>19</sup> and pes calcaneus.<sup>20</sup> Additionally, he investigated myositis ossificans,<sup>21</sup> traumatic cubitus varus,<sup>22</sup> and wrote a treatise about toe fractures.<sup>23</sup>

Nicoladoni was also very innovative in general surgery. He reported new ideas for enterostomy<sup>24</sup> and performed operations especially for the treatment of inguinal hernias.<sup>25–27</sup>

He contributed in the field of genitourinary surgery. He reported on 50 cases of tumors in the female genital tract in which he performed laparotomies.<sup>28</sup> Furthermore, Nicoladoni performed operations on the bladder<sup>29</sup> and also those for treating vaginal-urethral fistulas.<sup>30</sup> Finally, he made contributions in clinical<sup>31</sup> and experimental peripheral nerve surgery.<sup>32</sup>

## ■ Conclusions

Carl Nicoladoni (1847–1902) of Austria, Professor of Surgery, wrote several books on scoliosis focused on the anatomy and mechanism of this spinal disorder. Nicoladoni also collaborated with other industrious scientists working in the area of spine and yet introduced the results of his own observations and experience based on detailed anatomic and biomechanical studies. His works in the field of scoliosis significantly contributed to the enrichment of understanding the mechanism and the structure of scoliosis, and their overall importance and scientific value are far beyond the boundaries of the nineteenth century.

### ■ Key Points

- Carl Nicoladoni (1847–1902) of Austria, Professor of Surgery, wrote six books on scoliosis.
- Nicoladoni gave comprehensive descriptions of juvenile and adult scoliosis based on a thorough anatomic and kinetic investigation.
- Nicoladoni's commitment to the research of scoliosis significantly contributed to the improvement of understanding the mechanism and structure of scoliosis.

### Acknowledgments

The authors thank Verena Plankl (The librarian at the Clinic Library) for her invaluable assistance.

### References

1. Albert E. Zur Anatomie der Skoliose. *Wiener klinische Rundschau*. 1895;33:513–515.
2. Castiglioni, A. Later nineteenth and twentieth centuries (Orthopedics). In: Castiglioni, A, ed. *A history of surgery*. Translated from Italian by Krumbhaar, E.B. New York: Jason Aronson; 1969:877–879.
3. Haas LF. Joseph Hyrtl (1811–94). *J Neurol Neurosurg Psych*. 1996;61(2):130.
4. Haeseker B. 1891–1991: The centenary of innovative reconstructive hand surgery by Carl Nicoladoni. *Br J Plast Surg*. 1991;44:306–309.
5. Hesse F. Erwin Payr zum Gedächtnis. *Chirurg*. 1960;31:95–96.
6. Kyle RA, Shampo MA. Joseph Hyrtl - anatomist of the 19<sup>th</sup> century. *Mayo Clin Proc*. 2001;76(5):456.
7. Major RH. Nineteenth century—The second half. In: Major RH, ed. *A history of medicine*. Illinois: Charles C. Thomas Publisher; 1954:772–787.
8. Major RH. Nineteenth century—The second half. In: Major RH, ed. *A history of medicine*. Illinois: Charles C. Thomas Publisher; 1954:926,1044.
9. Nicoladoni C. Daumenplastik. *Wien Klin Wochenschr*. 1897;28:663–666.
10. Nicoladoni C. *Über Sehmentransplantation*. 54. Versammlung deutscher Naturforscher und Aerzte in Salzburg; 1881.
11. Nicoladoni C. *Die Torsion der Skoliotischen Wirbelsäule*. Stuttgart: Verlag von Ferdinand Enke; 1882.
12. Nicoladoni C. *Die Architektur der skoliotischen Wirbelsäule*. Wien: Aus der Kaiserlich-Königlichen Hof- und Staatsdruckerei, Buchhändler der Kaiserlichen Akademie der Wissenschaften; 1889.
13. Nicoladoni C. *Die Architektur der kindlichen Skoliose*. Wien: Aus der Kaiserlich-Königlichen Hof- und Staatsdruckerei, Buchhändler der Kaiserlichen Akademie der Wissenschaften; 1894.
14. Nicoladoni C. *Die Skoliose des Lendensegmentes*. Wien: Aus der Kaiserlich-Königlichen Hof- und Staatsdruckerei, Buchhändler der Kaiserlichen Akademie der Wissenschaften; 1894.
15. Nicoladoni C. Anatomie und Mechanismus der Skoliose. In: Kocher, König, von Mikulicz, eds. *Bibliotheca Medica*. Stuttgart: Verlag von Erwin Nagele; 1904.
16. Nicoladoni C. *Anatomie und Mechanismus der Skoliose*. Wien: Urban & Schwarzenberg; 1909.
17. Nicoladoni C. Zur Therapie des Pes equinus paralyticus. *Separat-Abdruck aus der Wiener Medizinischen Presse*. 1882;11,12:1–7.
18. Nicoladoni C. v. Dumreicher's Methode zur Behandlung drohender Pseudoarthrosen. *Wien Med Wochenschr*. 1875;5:80–84.
19. Nicoladoni C. Zur Arthrotomie veralteter Luxationen. *Wien Med Wochenschr*. 1885;23:729–734.
20. Nicoladoni C. Zur Lehre vom Pes calcaneus. *Wien Med Wochenschr*. 1894;9:360–363.
21. Nicoladoni C. Myositis ossificans progressiva. *Separat-Abdruck aus der Wiener Medizinischen Blätter*. 1878;24:1–24.
22. Nicoladoni C. Cubitus varus traumaticus. *Zeitschrift für Heilkunde*. 1884;5:36–49.
23. Nicoladoni C. Über Zehenfrakturen. *Wien Med Wochenschr*. 1881;52:1–12.
24. Nicoladoni C. Idee einer Enteroplastik. *Separat-Abdruck aus der Wiener Medizinischen Presse*. 1887;50:1–2.
25. Nicoladoni C. Resection des Darmes bei gangränöser Hernie. *Wiener Medizinische Blätter*. 1879;6:1–10.
26. Nicoladoni C. Perihernöse Phlegmone, ein Beitrag zur Lehre von dem entzündeten Bruche. *Wien Med Wochenschr*. 1875;36:793–796.
27. Nicoladoni C. Hundert Radikaloperationen von Leistenhernien ausgeführt nach dem Verfahren Bassini's. *Wiener Medizinische Presse*. 1893;22:841–845.
28. Nicoladoni C. 50 wegen Tumoren am weiblichen Genitale ausgeführte Laparotomien. *Wiener Medizinische Presse*. 1887;10:333–347.
29. Nicoladoni C. Operation des hohen Blasenschnittes. *Wiener Medizinische Presse*. 1881;15:1–7.
30. Nicoladoni C. Verschluss der Scheiden-Urethralfisteln. *Wien Med Wochenschr*. 1882;14:1–7.
31. Nicoladoni C. Beiträge zur Nerven Chirurgie. *Wiener Medizinische Presse*. 1882;27:853–856.
32. Nicoladoni C. Untersuchungen über die Nerven aus der Kniegelenkscapsel des Kaninchens. *Wien Med Wochenschr*. 1873.
33. [No authors listed]. The classic. Plastic surgery of the thumb and organic substitution of the fingertip (antichiroplastic surgery and finger plastic surgery). By Carl Nicoladoni, 1900 (Translated in English by Arthur Lietze). *Clin Orthop*. 1985;195:3–6.
34. Payr E. Ein Nekrolog (Carl Nicoladoni). *Deutsche Zeitschrift für Chirurgie*. 1903;68:1–10.
35. Schwokowski CF. On the 50th anniversary of the death of Erwin Payr (1871–1946). *Zentralbl Chir*. 1996;121:335–339.
36. Von Meyer H. Die Mechanik der Skoliose. Ein Beitrag zur Lehre von den Missgestaltungen des Knochengestütes. *Virchows Arch*. 1866:225–253.