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On the shoulders of giants: a history of success and a future of excellence – Istituto Ortopedico Rizzoli

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Abstract. – In 1896 the Rizzoli Orthopedic Institute was inaugurated in Bologna, an important hospital whose history is strictly connected with the development of the orthopedic discipline in Italy. The aim of this manuscript was to retrace the history of the institution by analyzing the work of the main personalities who have contributed to making the Italian Orthopedic Institute still famous in the world today.

Key Words:
History of Orthopedics, Francesco Rizzoli, Alessandro Codivilla, Vittorio Putti.

On the 28th day of June in 1896, the inauguration of the Rizzoli Orthopedics Institute took place in Bologna with the attendance of various dignitaries and Italian royalty, officially giving birth to the national development of the orthopedic discipline. Once the home of the ancient San Michele in Bosco monastery in the hills of Bologna, Rizzoli had become a newly established hospital characterized by modern equipment for the treatment of diseases of the musculoskeletal system. For many centuries, the ancient convent nestled in the hills had been the home of the Olivetans, a suborder of the Benedictines. The iconic structure also housed some of the greatest artists of Italian 16th and 17th century art who worked there: from Giorgio Vasari to Ludovico Carracci to Guido Reni. It would then later be abandoned during the Napoleonic period due to the suppression of ecclesiastical orders. The transformation of the ancient structure into a treatment center was possible in 1880 thanks to Professor Francesco Rizzoli, a renowned surgeon of international acclaim, who had established that the ancient convent would be transformed into an Orthopedic Hospital bearing his name with the intention to develop and serve the entire nation and that it would be directed by him until his last days[1]. Unfortunately, this last part of the statement would not be fulfilled, as just a few months after his testament, Rizzoli passed away suddenly on May 24, 1880. Francesco Rizzoli (1809-1880), who was primarily involved in general surgery with particular reference to obstetrics, was passionate about treating patients with musculoskeletal deformities, so much so that he would go on to design and invent new tools for that discipline which, according to his correct predictions, would be detached from the field of general surgery to become a branch in its own right. Among his personal instruments, now preserved in the Rizzoli Hospital Library to be admired, one can find, in addition to forceps and other obstetrics instruments, amputation saws, ossivorous pliers and craniotomies and, above all, what Rizzoli called the "fracturing machine" which he himself had invented and used to shorten the healthy limb in case of patients suffering from limb dystree. This device, defined scientifically as "osteoclast", had been designed and used for the first time, with excellent results, on a nine-year-old girl, daughter of a prominent figure in Bologna on April 24th, 1847. Rizzoli had caused a fracture in the third distal femur of the healthy limb to correct a severe claudication[2]. It must be remembered that all this occurred without the aid of X-rays, whose use was discovered by Roentgen only in 1895. Rizzoli name is also linked to other innovative surgical interventions such as the treatment of the ankylosis of the jaw, the resection in the angular ankylosis of the knee and the tenotomy of the Achilles tendon to facilitate the reduction of fractures of the III lower leg. He also made contributions to innovating the field of medical "aids" with his creation of a particular orthopaedic bed design[3]. As described by

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Professor Delitala[4], the director of the Bolognese Institute from 1940 to 1950, Francesco Rizzoli can be considered as "the pioneer who paved the way for the birth of an Institute model". But it was Pietro Panzeri (1849-1901), a distinguished Milan surgeon who divided himself between Bologna and Milan where he was also Director of the Institute of Rachitici (today known as the Gaetano Pini), who would lead the Rizzoli Hospital in the first years of its birth. Indeed, Panzeri enabled the Hospital to flourish, thanks to the prestigious reputation he enjoyed as a surgeon, bringing with him a large and wealthy clientele. It was only from 1899 that, after Panzeri, Alessandro Codivilla (1861-1912) became the director and the Orthopedic Institute would achieve even greater prestige also on an international level. Under the direction of Codivilla, every single service of the Institute improved; from rehabilitation facilities to the workshop, from the laboratory to the newly created radiology department. The first X-ray performed at Rizzoli took place on December 20, 1899 of an elbow in ankyloses[5]. But Codivilla's greatest achievement was that of having brought the pathologies of the musculoskeletal apparatus into the operating room. Having acquired significant experience in other hospitals where he previously worked on cranial and abdominal surgery, he extended his surgical experience to the injuries of the organs of movement through daring and innovative interventions, which made him deserving of the title of the father of Italian orthopedic surgery[4]. It would be reductive, however, to recognize him only for being an orthopedic surgeon who, until then, was accustomed to plasters, corsets and mechanical equipment for the correction of the deformities of his patients. His great merit was, first, that he "framed, through experimental studies and practical applications of the operative technique, an informal subject, codifying it according to the laws of muscular Physiology, Bone Biology and Articular Mechanics"[3]. He was interested in the treatment of congenital disorders and acquired deformities, such as the dislocation of the hip and the patella; he took care of the pseudoarthrosis, whether they were congenital or secondary to fractures or osteomyelitis; he devoted himself to the field of scoliosis and osteoarticular tuberculosis, always in pursuit of a conservative or surgical solution, not without having carefully studied the etiology, clinical and radiographic images of each morbidity. His ambitious and innovative interventions led him to design and subsequently create "his tools of the trade" which would have made by Lollini Brothers who were manufacturers of surgical instruments in Bologna. Codivilla is also linked to significant innovations and discoveries in the surgical field. In fact, his transplant of tendon, tenodesis, syndesmotome and tenotomy for the surgical treatment of clubfoot are still to this day remembered and referenced[6]. His intervention performed on a clubfoot in 1905, is still applied today in the operating rooms of the Rizzoli Hospital for selected cases. Codivilla's innovative techniques were truly revolutionary at the time since, until then, this deformity in children's feet was treated either conservatively or through the application of braces created by the famous anatomist and professor of the 18th and 19th century, Antonio Scarpa. All the surgical attempts made during the nineteenth century had proved to be irreversible before Codivilla[7]. Notably, the progress made by Codivilla on tendon transplants in relation to patients affected by polio, the great scourge of that period, was also fundamental[8]. But what the most brilliant Bolognese orthopedic surgeon is remembered for is, without a doubt, the invention he devised in 1902; the direct traction on the skeleton by means of a nail used for the treatment of the malconsolidation of fractures and bone deformities (Figure 1). Codivilla fought a scientific battle to reclaim his patent rights over the invention against the Swiss Fritz Steinmann who brought his discovery to the orthopedic world only in 1907. The dispute can be considered to have been settled by the medical historian Peltier who stated that Codivilla was the first to apply direct traction on the human skeleton, while Steinman was the first to apply this method in the treatment of fresh fractures[9]. Thanks to Professor Codivilla, the name of the Rizzoli Institute began to cross local borders to become renowned throughout the world. In 1901, Codivilla would make Italian medical history as being the first Italian surgeon to attend the most important medical congresses held in Europe. In 1903 Codivilla was nominated as a corresponding member of the then American Journal of Orthopedic Surgery, one of the most important magazines in the field. Due to his ailing health, he had to refuse the invitation to go to Washington as an official speaker at the International Tuberculosis Congress in 1908 but would instead crossed the ocean in 1910 to go to Buenos Aires to accept the invitation to hold a series of Conferences there and, on his return, would also stop in Lisbon, Paris and Brussels for dissertations and

Figure 1. Direct traction on the skeleton by Alessandro Codivilla. Bologna, Biblioteche Scientifiche, Istituto Ortopedico Rizzoli.

surgical demonstrations. Unfortunately, Codivilla passed away in 1912 at only 51 years of age. His death was greatly mourned and his absence in the field was felt by his students and collaborators who wondered what other great innovations would have come from that brilliant man who was so deeply knowledgeable of his subject, if only he had lived longer. But it was with Codivilla's successor that the Rizzoli Institute would be able to acquire worldwide resonance, becoming "the mecca of orthopaedics"[10]. Vittorio Putti, a favourite pupil of Codivilla, took over the reins of the Hospital after the death of his beloved teacher and mentor. An excellent speaker, manager, surgeon, polyglot and all around charismatic figure, Vittorio Putti knew how to establish relationships with the most eminent international figures of his time. In fact, Putti animated the orthopedic world with his presence so much so that his absence at an Italian orthopedics congress in 1929 gave rise to rumors among orthopedists from all over the world[11]. Since his first appearance at a Congress in Berlin in 1908, with Codivilla[12], there was no scientific event that he wasn't invited to participate in, both in Europe and overseas. He travelled to North America for the first time in 1919 and would return every so often over the years and travelled three times in South America where he established an exchange agreement with the various South American states. Putti was well respected and revered by his students so much so that some of his students from those countries, who had come to specialize at Rizzoli, considered him the father of their specialty in this part of the world[13]. If Codivilla had laid the foundations of this new branch of orthopedic surgery, Vittorio Putti (1880-1940) raised it to discipline, adding traumatology among the orthopedic interests, a need dictated, however, also by contingent matters. With the outbreak of the First World War in 1915, Putti was faced with the myriad of problems associated with such a devastating and impactful war. Given the ever increasing wounded and mutilated patients, to whom Putti had to treat, this forced him to increase the receptivity of the beds in the Institute, transfer the premises of the orthopedic workshops far from the hospital, develop new prostheses and new surgeries on amputees' stumps, set up a rehabilitation house in the city for the wounded, all the while intertwining new relationships at the international level with the representatives of the inter-allied forces for the exchange of experiences[3]. After the war ended, which still left behind a devastating and lasting impact on the city for some time, Vittorio Putti was able to re-

Figure 2. Vittorio Putti in the Operating Room. Bologna, Biblioteche Scientifiche, Istituto Ortopedico Rizzoli.

turn to treating his orthopedic patients. He pursued many fields of interest for which he tried to find a solution, always experimenting and inventing new methods and suitable tools: from the treatment of congenital hip dislocation to knee arthroplasty, from post-traumatic deformities to bone tumours, from bone transplants to the treatment of ankylosis, from paralysis to peripheral nerve injuries, to the amputation of the amputation stumps[14]. Furthermore, he devoted himself to the treatment of bone tuberculosis and was able to convince the Directors of Rizzoli in 1923 to purchase an old hotel in Cortina d'Ampezzo and made it an Alpine branch of the Institute. He called the new structure Istituto Elioterapico Codivilla to pay homage to his mentor and teacher[15]. From the osteotome for the resection of bone heads, to the osteosynthesis screw in the fractures of the neck of the femur, to his innovations in the operating room table for limb surgery (Figure 2), Putti's contributions to the field of orthopedics is truly extraordinary. The inventions and innovative methods of treatment he was able to experiment and implement in patients with problems of the musculoskeletal system are so vast that his writings were collected in two volumes of well over 900 pages each[4]. Putti was also a bibliophile and a lover of the history of medicine. In his personal library there are still today more than 1000 ancient medical books he acquired with his own private funds and subsequently donated, with a 1930 holographic testament, to the Istituto Rizzoli where they can still be admired and consulted. Shortly before his death in 1939, Peter Bade, an orthopedic doctor from Hanover, declared the Rizzoli Orthopedic Institute as the best institution in its field and the most beautiful in the world[16]. Among the innumerable satisfactions Putti had, this was by far the greatest. But it would also be the last one. A few months later, on November 1, 1940, Putti passed away, leaving this world with his glorious legacy and extraordinary achievements to be remembered and immortalized. The memory and the science of these three great Bolognese men who "in different ways concurred to find, consolidate and perfect orthopedic science", continued over time until today when the Rizzoli Institute, always at the forefront, is still acknowledged as a "Mecca of Orthopedics" by surgeons and researchers from all over the world[4,17].

Conflict of Interest

The Authors declare that they have no conflict of interest.

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