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Serie "Storia della Pneumologia Italiana" *a cura di Mario De Palma*

Felice Cova (1877-1935), the interventional phthisiologist

Felice Cova (1877-1935), il tisiologo interventista

Gian Pietro Marchetti[1], Michele Mondoni[2]

[1]Department of Pneumology, ASST Spedali Civili, Brescia, Italy; [2] Respiratory Unit, ASST Santi Paolo e Carlo, San Paolo Hospital, Milan, Italy

Summary

Felice Cova (1877-1935) was the first Italian physician to perform the Jacoabaeus operation, i.e. the thoracoscopic resection of pleural adhesions. In the first decades of the twentieth century, the procedure was key to allow the pneumothorax formation and then the treatment of tuberculosis.

This article summarizes the main biographical issues of Felice Cova, since the academic studies as a disciple of Golgi and Forlanini until he became the head of a pulmonary division in Vittorio Emanuele III Sanatorium in Garbagnate (Italy), a modern medical facility in the forefront of the treatment of TB.

We highlight the role of Cova, a pioneer and an innovator in the field of radiology and pleural endoscopy. He designed new instruments, introduced new perspectives of the thoracoscopy beside its application for intrapleural pneumolysis and broadened the horizons of pleural diseases studies.

His skill and speed in performing thoracoscopy made him famous and many European colleagues used to call him the "Paganini of the thoracoscope".

Furthermore, through his articles and books (e.g. "the Atlas Thoracoscopicon") he was the physician who mostly contributed to teach and spread the technique throughout Europe.

Key words: thoracoscopy, tuberculosis, Jacobaeus operation, pthysis, sanatorium, pleural disease, intra-pleural pneumolysis

Riassunto

Felice Cova (1877-1935) è stato il primo medico italiano ad eseguire un'operazione di Jacobaeus, cioè la resezione toracoscopica di aderenze pleuriche. Nelle prime decadi del ventesimo secolo, questa procedura era spesso cruciale per garantire la formazione di uno pneumotorace e quindi la cura per la tubercolosi.

Questo articolo riassume i principali aspetti biografici di Felice Cova, dagli studi universitari come discepolo di Golgi e Forlanini fino alla sua nomina a direttore di una divisione di tisiologia nel sanatorio Vittorio Emanuele III di Garbagnate (Italia), un moderno ospedale all'avanguardia nella cura della tubercolosi.

In questa biografia viene sottolineato il ruolo di Cova come pioniere ed innovatore nel campo della radiologia e della endoscopia pleurica. Cova progettò nuovi strumenti, introdusse nuove prospettive nell'ambito della toracoscopia oltre al suo impiego nella pneumolisi intrapleurica ed allargò gli orizzonti degli studi sulla patologia pleurica.

La sua abilità e la sua rapidità nell'eseguire la toracoscopia lo resero famoso e molti colleghi Europei lo denominarono "il Paganini della toracoscopia".

Infine, attraverso i suoi articoli e i suoi libri (come l'Atlas Thoracoscopicon), egli fu il medico che più contribuì ad insegnare e diffondere la toracoscopia in Europa.

***Parole chiave**: toracoscopia, tubercolosi, operazione di Jacobaeus, tisi, sanatorio, patologia pleurica, pneumolisi intra-pleurica*

Background

At the end of the nineteenth and during the first decades of the twentieth century, the incidence of tuberculosis (TB) significantly increased in both Western Europe and United States [1,2].

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Correspondence
Michele Mondoni
Respiratory Unit, ASST Santi Paolo e Carlo,
San Paolo Hospital
via Di Rudinì 8, 20142 Milan, Italy
michele.mondoni@asst-santipaolocarlo.it

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Italian national anti-TB campaigns led to the introduction of many preventive and clinical services as well as to the construction of new sanatoria and healthcare facilities, while Italian physicians (e.g. Forlanini, who first introduced the artificial pneumothorax) gained popularity worldwide [3,4].

In 1910 Hans Christian Jacobaeus, a Swedish physician, first described the use of a cystoscope to study the pleural cavity and cut fibrous adhesions which hampered the collapse of the lung and then the pneumothorax formation [5-8]. This technique, known as "Jacobaeus operation", was the base of the modern medical thoracoscopy and video-assisted thoracic surgery (VATS) [7].

The first Italian scientific publication on thoracoscopy was written by Stolkind in 1914, a Russian physician emigrated to Nervi (Italy) [9]. However, Felice Cova, a phthisiologist from Milan, was the first physician who performed the Jacobaeus operation in Italy. Furthermore, he first fully understood the potential of the technique in the study of pleural diseases [10,11]. Thanks to his work and teaching, he left a deep mark in the history of the endoscopy of pleural diseases.

Felice Cova was a pioneer and an innovator: he designed new instruments, introduced new perspectives of the technique and broadened the horizons of pleural diseases studies. Through his articles and books he taught and spread the technique throughout Europe.

Methods

A non-systematic, narrative literature review was conducted using PubMed and Google as a search engines. The searches were conducted without any time restriction (inception until June 2021). In addition, an extensive private collection of old books and reports was reviewed. Reports written in the English, Italian, or German language were selected. The reference lists of recent articles were used to retrieve articles and books not available in the electronic databases.

Biographical notes

Felice Cova was born in Milan on the 7th of February 1877 and graduated with full marks from Pavia University School of Medicine in 1903 (12-14) (Fig. 1). During university he attended a 2-year internship in General Pathology directed by Professor Camillo Golgi (Nobel prize for Medicine in 1906) and then a 3-year internship in the Medical Clinic of the University, directed by Professor Carlo Forlanini. After the graduation he was a volunteer assistant in the General Pathology laboratory. Throughout his professional career he kept taking up a correspondence with these illustrious teachers, as witnessed by several letters.

Figure 1. Felice Cova, pictures throughout his career, from the graduation in 1903 with Professor Forlanini until he became the chief of the Women Division in Vittorio Emanuele III Sanatorium of Garbagnate, Milan (Italy).

In 1904 he served the Army as a volunteer in the Third Medical Company and in 1905-1906 he was first medical assistant in Ambri-Piotta Ghottard Sanatorium, which at that time was directed by Professor Fabrizio Maffi.

He moved to Milan where he worked in the Maggiore Hospital as a practitioner in 1906 and then as an assistant in bacteriology (1907) and pathological anatomy department (1808-1809) [12-14].

In 1911 he won a competition among more than 100 candidates and was assumed as medical assistant in Maggiore Hospital, Milan.

In 1912 he was the winner of a scientific price (named Parravicini) which allowed him to spend one year throughout Europe (he was in Germany, Norway, Denmark and Sweden) to study local anti-tuberculosis campaign organizations. During this journey he probably met Jacobaeus [12-14].

In 1913 he became the vice-chief of the tuberculosis department of Milan Maggiore Hospital, where he promoted artificial pneumothorax therapy. During this year he became the Editor of the journal "La Critica Medica" and took part to the XI International Conference against tuberculosis in Berlin. In 1914 he was the deputy chief of the branch of Cernusco, near Milan [12-14].

In 1915 he participated First World War as Medical Officer (lieutenant and captain) in the Forth Cavalry Division and was awarded with two Crosses of Merit on the Karst in Monfalcone, Italy.

In 1917 he worked as bacteriologist in the Maggiore Hospital and then took over the radiology unit at Milan Military Hospital, working simultaneously in San Vittore Hospital in Milan [12-14].

Between September 1919 and April 1921 he was the director of the Nursing Home the Hotel Villa Igea in Capri, which at that time was also used as sanatorium [12,13,15].

In 1921, he moved back to Milan to the Maggiore Hospital until 1924, when he became the chief of the women division of the Hospital Sanatorium Vittorio Emanuele III in Garbagnate, near Milan (Fig. 1).

Vittorio Emanuele III Sanatorium, which became operative from 1923, rapidly became a modern 1000-beds medical facility in the forefront of the treatment of TB. During the second decade of the twentieth century the mortality for tuberculosis in Milan was of about 200 people/year/100000 inhabitants and many TB facilities were built to hamper the dramatic spread of disease [12-14].

Cova filled many administrative spots: he was the president of the Hospital Physicians Association, advisor of the Popular Sanatoria Association of Milan, advisor of the Prasomaso Sanatorium and of the Serotherapy Institute of Milan. He was president of the Milan Association Against Tuberculosis [12-14,16].

In 1927 he won the "Fondazione Forlanini" price and from 1927 to 1932 he was the president of an anti-TB medical facility (named Dispensario) in Milan. In 1932 he represented the Vittorio Emanuele III sanatorium at the International Conference against tuberculosis in Amsterdam.

Since 1922, he was a member of the fascist national party and the president of the fascist group "Baracca" in Milan.

He married Maria Villoresi and had two children: Pierluigi Cova Villoresi, radiotherapist and pathologist, who took part of the Benito Mussolini controversial autopsy and Marialuisa, a lyrical singer [13].

He died on the 1st of February 1935 [12-14,16].

The man and the physician

Felice Cova was described as a calm, precise and strong-willed person with a mathematical mind and an impressive power of observation. Patients were devoted to him. His coworkers considered him as an inspiring leader and a father [12,14].

During the years in Vittorio Emanuele III Sanatorium, Felice Cova led an excellent medical team: Virgilio Ferrari, the vice-chief, who subsequently became the head of a new pulmonary division and then the major of Milan, E. De Castiglione and E. Tarantola (medical assistants) were the main co-workers and published important contributions on the Jacobaeus operation. The daily clinical activity of the team was also assisted by Professor Mario Redaelli, a surgeon and the head of the Men Division in the sanatorium [14,16].

Figure 2. The main books written by Cova: the first concise guide on the technique "Note di tecnica nella operazione di Jakobaus" (A), "Semeiotica polmonare ragionata" (B), who was studied by generations of students and pulmonary physicians, "La Toracoscopia - Operazione di Jacobaeus" (C) which won the I International Competition of the Carlo Forlanini Foundation and the most famous book "Atlas Thoracoscopicon" (D). E: The original signature of Felice Cova.

Felice Cova was a versatile pulmonologist and physician. Throughout his career he wrote 70 scientific works not only on tuberculosis and thoracoscopy but also on chest imaging, asthma and cough [14,17,18]. He was passionate of medical semiotics and the year before his death he published a book on this topic, "Semeiotica polmonare ragionata", who was studied by generations of students and pulmonary physicians [19] (Fig. 2).

Felice Cova was an inventor: he designed new caustic loops for the Jacobaeus operation and curiously, in collaboration with the company Viola of Milan, introduced in 1929 a new hystero-colposcope [20,21].

He was also a researcher in the field of radiology as he studied teleradiography and pulmonary telestereoradiography. In this context, he invented a new radiological instrument, built by the Company Meschia, named Cova-Meschia [22,23].

In 1955, Garbagnate Hospital remembered him with a specific conference and a marble table with a bronze effigy and a valuable summary of his medical career in the Sanatorium, devoted to the study of medical semiotics, collapse therapy, Jacobaeus operation and chest radiology [16].

The "Paganini of the thoracoscope"

Felice Cova was the first physician to perform a Jacobaues operation in Italy but the exact year of the first thoracoscopy is uncertain [9,20].

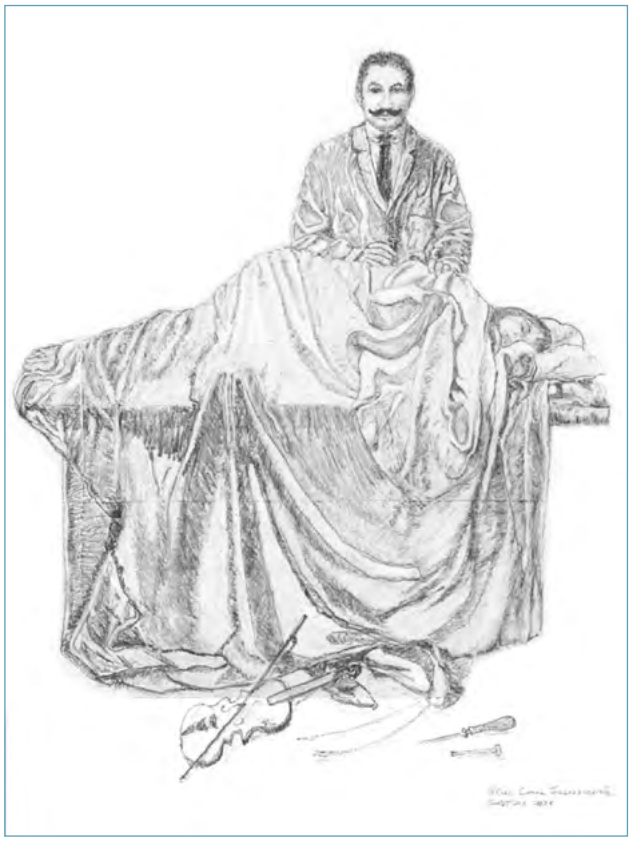

Figure 3. Felice Cova, the "Paganini of the thoracoscope", performing his first documented thoracoscopy with Jacoabaeus operation on a young Swedish patient, in Capri in 1920 (original drawing of Dr. Pierluigi Aliprandi).

According to De Castiglione, a close collaborator, Cova performed the first Jacobaues operation in Italy in 1921 and was the only to use the technique in Italy for several years [9]. According to Stroppa, the Director of the Garbagnate Sanatorium, he performed the first thoracoscopy in 1922 [14].

However, Cova himself reported a thoracoscopic pleural adherence excision in a young Swedish patient with tuberculosis in October 1920 at the Nursing Home of Villa Igea, Capri [23] (Fig. 3). His second thoracoscopy was then performed in Prasomaso Sanatorium, in northern Italy [24].

In 1923 he wrote his first concise guide on the technique with particular emphasis on the safety ("Note di tecnica nella operazione di Jakobaus") [24] (Fig. 2A). In 1927 he published his first book entitled "La Toracoscopia - Operazione di Jacobaeus", which won the I International Competition of the Carlo Forlanini Foundation and was awarded with a money prize of 5000 lira [12,14,20] (Fig. 2C).

The book is divided into two sections: the first is on the diagnostic aspect of the thoracoscopy while the second on the Jacobaeus operation. The chapters are enriched by 31 clinical histories (12 about diagnostic thoracoscopy and 19 on Jacobaeus operation), many chest radiographies, colour drawings depicting the most common endoscopic patterns and some figures showing instruments and the technique [20] (Fig. 4).

The book is based on the experience gained in 104 thoracoscopies and 65 Jacobaeus operations [20].

In the book, Cova provides an accurate description of the instruments and the technique as well as of the normal anatomy of the pleural space. He first described the blood circulation into the pleural adhesions which occurs in centripetal direction for the arteries (i.e. from the chest wall to the lung) and in centrifugal direction for the veins [20].

Cova used to work with a thoracoscope with a lateral view (90 degrees), which was 24 centimeters in length and 0,5 cm in diameter (Fig. 4D). It was inserted in the chest cavity through a valve trocar (which allowed to maintain the original endothoracic pressure), 20 cm in length and 0.5 in diameter grafted on a sharp awl (Fig. 4A). A 3 volts light bulb was placed at the end of the thoracoscope [20].

The caustics loops for the resection of the pleural adhesions were inserted through a second, small, access (Figs. 4C-E).

They were both straight, curve or with a moving edge and were 2.9 mm in diameter and 34 cm in length. A 22 cm long forceps was part of the instruments and was employed to take pleural biopsies and for foreign body removal [20] (Fig. 4B).

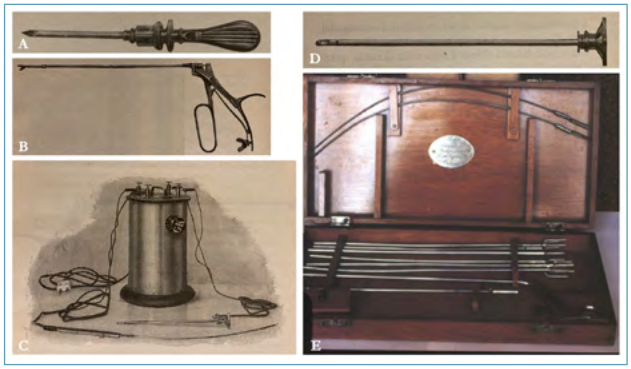

Figure 4. Instruments used by Cova for thoracoscopy and Jacobaeus operation, described in his book "Toracoscopia, Operazione di Jacobaeus". Milano, Sperling & Kupfer; 1927; A: valve trocar, 20 cm in length and 0.5 in diameter, grafted on a sharp awl. B: 22 cm long forceps to take pleural biopsies and for foreign body removal. C: voltage regulator with thoracoscope and caustic loop. D: thoracoscope (24 centimeters in length and 0.5 cm in diameter) with a lateral view (90 degrees). E: picture of the original instruments of Cova, preserved in Vittorio Emanuele III Sanatorium of Garbagnate, Milan (Italy).

Cova designed and introduced new instruments. In order to avoid the potential melting of the platinum loops, he commissioned the construction of iron loops, more robust and cheaper. He invented the moving caustic loop, i.e. a caustic loop with a jointed end in order to reach adhesions located in the distal region of the chest wall as the apex of the lungs [20].

As highlighted in several articles and books, Cova was particularly careful about the safety of the technique. In order to decrease the bleeding complications and shorten the procedure, he also designed a new caustic loop, which was able to cauterize and cut the adherence simultaneously [20].

The resection of the pleural adherences to allow the lung collapse was, at that time, the main goal of the thoracoscopy [6,7,20]. In patients not suitable for the Jacobaeus operation due to large adhesions, the technique was also employed to study the exact extension of the adherences to select those patients who might have been treated with partial thoracoplasty, a surgical technique of lung collapse [20].

Cova was the first to underline the role of thoracoscopy as a useful diagnostic tool in the study of pleural diseases (i.e. spontaneous pneumothorax, pleural neoplasms, pleurisy) and the mediastinum.

In this context, Cova underlined that the necessity to induce a pneumothorax for diagnostic purposes only was considered a key limitation of the technique [20].

Notably, little is told in his books about the role of thoracoscopy in the diagnosis of pleural malignant lesions; they represent one of the leading indications of the modern pleural endoscopic examination but were a secondary cause of pleural diseases at that time. Curiously, thoracoscopy is no longer a technique aimed at cut pleural adhesions. On the contrary, the technique is often used to induce pleurodesis, i.e. to create pleural adhesions, to avoid relapsing pleural effusions in several pleural diseases (e.g. pleural malignancies) [25,26].

Cova performed about 700 thoracoscopies but very little is known about his whole casuistry related to thoracoscopic outcomes [12,16].

He was a confident, determined and very fast operator [12,14,27,28]. After his death, a disciple of him, the phthisiologist Nello Montanini in 1936 described a Jacobaeus operation in which Cova could cut nine ribbon-shaped and two tent-shaped pleural adherences in 25 minutes, without any complications [27].

Many European phthisiologists went to Italy to learn thoracoscopy from Cova [12,14].

His skill and speed made him famous. As reported by Abruzzini, many foreign colleagues used to call him the "Paganini of the thoracoscope" [28].

The Atlas Thoracoscopicon

The book which definitely made Cova famous throughout Europe was the Atlas Thoracoscopicon (Figs. 2D and 5A-G), printed in 1928 in two different formats (Fig. 5A) and embellished with an enthusiastic preface of Jacobaeus [29] (Fig. 5C).

In the Atlas art and science reached their meeting point. Until then no similar medical books had ever been written. The work shows the spread of thoracoscopy in daily clinical practice. The technique was no longer performed only by a small group of pthihsiologists. The experimental, pioneeristic phase of the technique got to the end. Thoracoscopy became a well-established technique which was worth teaching to pulmonologists, medical practitioners and students.

The Atlas reached a great popularity in Europe and in the subsequent decades was cited by several articles and books written on this topic [30].

Many European Colleagues, e.g. Brauer in the Deutsche Medizinische Wochenschrift, Jaquerod and the prestigious British Medical Journal cited the book [30].

After the frontispiece, in which a picture of the Garbagnate Vittorio Emanuele III Sanatorium is shown (Fig. 5B), the Atlas is composed by 50 trichrome tables: three protected by tissue paper, about the normal topographic anatomy of the pleural space, 38 about endoscopic patterns with the main pleural pathological findings and nine fully dedicated to the technique of the Jacobaeus operation (Figs. 5D-5G). Each table has a caption written in three different languages, i.e. Ital-

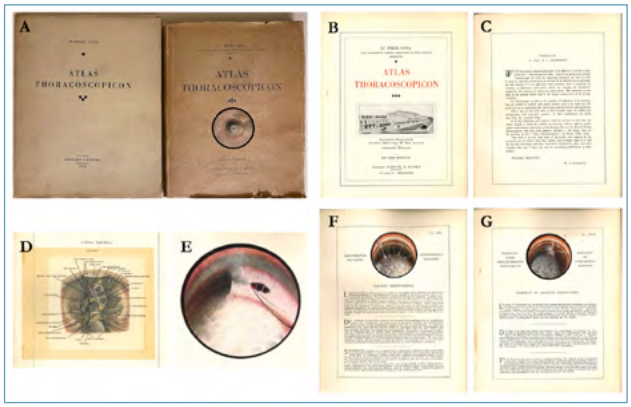

Figure 5. The Atlas Thoracoscopicon. A: two different available formats of the Atlas. The frontispiece of the Atlas with the picture of the Vittorio Emanuele III Sanatorium in Garbagnate, Italy (B) and the preface of HC Jacoabeus (C). D: trichrome table protected by tissue paper, about the normal topographic anatomy of the pleural space; E: trichrome table showing the endoscopic resection of a tent-shaped pleural adhesion. Trichrome tables showing a sero-fibrinous pleurisy (F) and the resection, during Jacobaeus operation, of a cord-shaped pleural adhesion (G). Each table has a caption written in three different languages, i.e. Italian, German and English.

ian, German and English, highlighting the international profile of the book [29] (Figs 5F, 5G).

The passion of Cova for the pleura and its iconography is well summarized by the words of an eminent Swiss colleague, Marc Jacquerod, who at that time was the director of the Leysin Sanatorium [30]. He wrote: *"Le Dr. F. Cova, l'éminent phtisiologue milanais, vient de publier un ouvrage qui n'est pas seulement une oeuvre scientifique de premier ordre, mais encore un chef-d'oeuvre d'art des plus remarquables. Son atlas nous fait voir, avec une réalité saisissante, les différents aspects de la plèvre malade, et cette plèvre n'est pas une plèvre morte, comme on la voit sur la table d'autopsie: il nous fait pénétrer, au cours même de la vie, dans l'intimité des tissues les plus cachés. C'est bien là ce qu'on peut appeler de la biopsie humaine, montrant les tissues en pleine activité vitale et fonctionnelle. Il vient de nous ouvrir une voie nouvelle; sa méthode d'exploration, basée sur la combination d'un pneumothorax artificiel et de la pleuroscopie, conduira sans doute à des découvertes fructueuses dans la domaine de la patholgie pulmonaire et thoracique. Ce bel ouvrage fait le plus grand honneur à la science médicale italienne, à la quelle on doit déjà tant de précieuses dècouvertes"* [30].

Conclusions

Felice Cova was a pioneer who inspired generations of pulmonologists.

In 1933 he wrote: *"All the pleural diseases, until now limited to scarce semiological data and autoptic findings, can now by light up by thoracoscopy"* [11].

As suggested by these words, he first guess the key role of the technique in the study of pleural diseases, beside its application for intrapleural pneumolysis. He was the physician who mostly contributed to the development and spread of thoracoscopy.

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Author contributions

MM and GPM: contributions to the conception and design of the work, acquisition, and interpretation of data for the work; drafting the work; final approval of the version to be published; agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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