

From pathologist to surgeon: the surgical tools inventions and techniques of Lodovico Brunetti

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Abstract. Lodovico Brunetti (1813–1899) was the first professor of pathological anatomy at the University of Padua (1855) and the founder of the current Morgagni Museum of Pathological Anatomy. His interest in the renewal of rachiotomy techniques through the development of new instruments, still in use today, is well known. Brunetti was also famous for his surgical skills and the invention of different tools used during his operations. We carried out a medical-historical research of the literature to deepen our knowledge on evolution of surgical tools and techniques in the late nineteenth century through the work and ideas of Brunetti. Although being full professor of Pathological Anatomy, Brunetti continued to operate from time to time as a surgeon. Among his surgical procedures, he performed several cystotomies, cataract and rhinoplasty, of which he described in detail the techniques and tools used, paying always particular attention to his current time innovations, for example citing the “Graefe’s knife” as an alternative to the keratotome and the “Thompson’s screw lithotripter”, whose prototype was presented in 1860 for lithotripsy practices. The University preserves several surgical instruments that matches the ones used by Brunetti, along with the different specimens of the Morgagni Museum, which bear witness to the operations made using these tools. His inventions are also still used today, while his ideas reflected the discoveries and innovations that characterized the late nineteenth century, also questioning old techniques and tools, often no longer functional or unsuitable for new innovative procedure that were arising in that period.

Keywords: Surgical tools; Rachiotomy; History of medicine; Pathology; Surgical techniques

Introduction

The innovation of anesthesia (1) and asepsis (2) in the second half of the nineteenth century led to new surgical procedures that were previously not possible beginning to be practiced, thus requiring new instruments. This paper explores the inventions and ideas of Lodovico Brunetti (Rovigno 1813 - Padua 1899), surgeon, pathologist, and inventor. Although Brunetti’s creations are not well known, nevertheless they have often been innovative and in step with the times and sometimes still used nowadays. (3)

Brunetti graduated in Medicine in Pavia in 1840 and then specialized in Surgery in Padua in the same year. Thus, he moved to Vienna to specialize in

Obstetrics and Ophthalmology, becoming also assistant to the famous pathologist Karl von Rokitansky (1804–1878). In 1855 Brunetti was called to the first Chair of Pathological Anatomy of the University of Padua. Later, he also established a museum of pathology, known today as the Morgagni Museum of Pathological Anatomy, where he began to collect pathological specimens and tools for study and didactic purposes. (4)

The new academic career led Brunetti to “put down the surgical knife [in order] to hold the pathological one”, a sacrifice that he defined as “very serious”, but necessary for the development of the discipline that was about to be reborn in Padua almost a century after the death of Giovanni Battista Morgagni (1682–1771). (5)

Among the various innovations of the Istrian physician figured a new technique for the conservation of human remains, called tannization, presented at the International Exhibition in Paris in 1867, where he obtained the “Grand Prix” in the arts and crafts section, for the excellent quality of its specimens and the innovative technique of tissue preservation. (6,7) Brunetti was also interested in the modernization of crematory techniques and also invented a prototype of a modern crematorium. (8)

In fact, during his apprenticeship with Rokitan-sky in Vienna, Brunetti began to show interest in the development of new surgical instruments, in particular, he manufactured a new rachiotome for anatomical dissections, already prototyped in 1844 and later introduced and presented in 1863. (9,10)

This tool was used to perform a rachiotomy through the opening of the vertebral canal with the removal of the laminae and the spinous process between the two transverse processes of the vertebrae. This procedure was intended to expose the underlying dural sac and spinal cord, usually for anatomical teaching and forensic medicine purposes. (9)

Before Brunetti’s invention, various tools were used to perform this procedure, such as curved and straight scalpels, wooden and iron hammers, hand saws with one or two parallel blades and it was only in 1830 that the first instrument dedicated to this practice was described by James Johnson (1777-1845), calling it a “rachiotome”. (10,11)

Currently, modern rachiotomies are performed with electric oscillating saws with rounded or fan-tailed blades, although the tools designed by Brunetti for precision operations are still used today. For example, Brunetti’s rachiotome is now in use at the Institute of Anatomy of the University of Padua, albeit in a commercial version, but not so different from the nineteenth century one, since it allows greater manual control during the incision of the vertebrae. Three models of tools for rachiotomy created by Brunetti are known: the “type one” rachiotome or cleaver model, “type two” or model with two “carpenter’s chisels” and “type three” or single chisel model (Figure 1). (10)

Several types of operations were also described by Brunetti, such as cystotomies, rhinoplasties, and ophthalmological operations, all carried out with a great

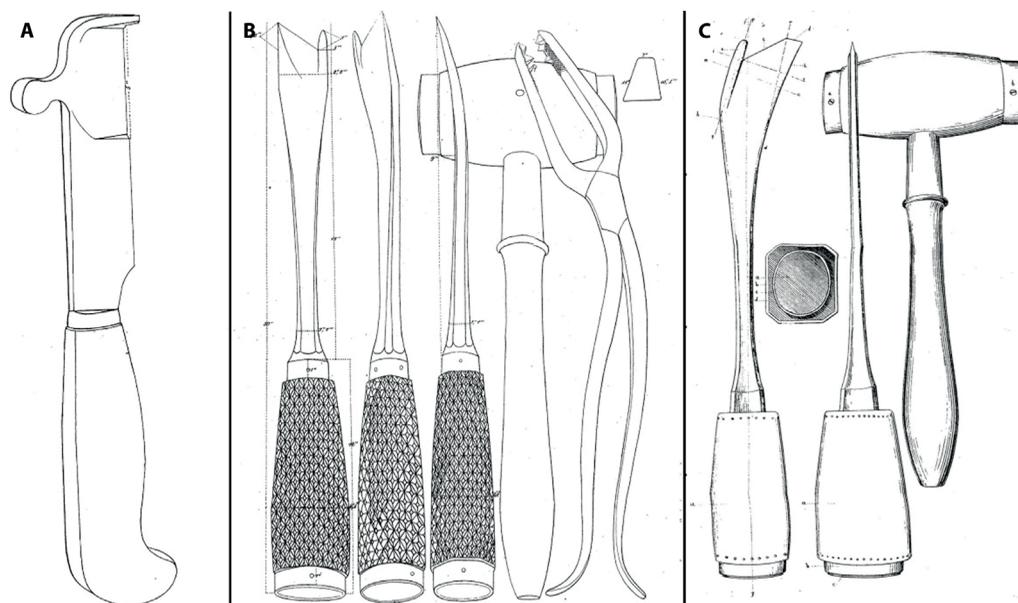


Figure 1. Brunetti’s rachiotomy tools: A) “type one” rachiotome or cleaver model; B) “type two” or carpenter’s model; C) “type three” or single chisel model (Modified from: Sopra il nuovo rachiotomo e sul metodo d’aprire lo speco vertebrale. Brunetti, 1863).

critical eye also attentive to the instrumentation and its evolution. (5)

The paper aims to shed light on the surgical techniques of the late nineteenth century and their evolution through the ideas and inventions of one of the protagonists of the medical history of the University of Padua.

Research material and methods

We carried out a medical-historical search of the literature to reconstruct the types of instruments used by Brunetti, correlating literary description with drawings and tools preserved in the archives of the University of Padua.

In fact, following recent research in the archive of the University of Padua, we discovered several medical instrumental kits, dated to the nineteenth century and used by the professor and doctors of the University, including some instruments comparable to those used by Brunetti.

Thus, we reconstructed the types of instruments used by Brunetti, along with those invented by him (Table 1).

Results and discussion

Later in 1876, Brunetti spent a period in Istria, returning to pursue his surgical career. In his

“Reminiscences of autumn 1876”, all the instruments used for the surgical activity were described, starting with those that made up his “pocket bag” (“Busta da tasca”), his personal tools: a surgical knife, a common tweezers, some generic probes, a grooved probe and finally two chisels “with a fixed handle” (Figure 2), donated by Doctor Luigi Barsan (or Rarsan, 1812-1893), an old colleague working as a general doctor in Rovinj. (5)

In addition to the general surgical instruments, he also had the so-called “ophthalmologist etui”, consisting of a normal keratome, a sickle needle, a Daviel spoon, and a spear knife preserved from the activities in Vienna with Dr. Ignaz Gulz (1814-1874), Austrian ophthalmologist. The method of cataract extraction was invented in 1747 by the French doctor Jacques Daviel (1696-1762), involving several instruments such as a corneal knife, a forceps, a needle, a spatula, and a spoon (Figure 3). This method influenced the ophthalmological practice in the eighteenth century, (12) leading also to the establishment of a Chair of Ophthalmology in Vienna in 1812, entrusted to Joseph Beer (1763-1821) and later in 1821 held by Anton von Rosas (1791-1855), of which Ignaz Gulz was assistant. (13,14)

Brunetti also mentioned his interest in the “Graefe’s knife”, an instrument created by the German ophthalmologist and surgeon Albrecht von Graefe (1828-1870) between 1864 and 1867 and used for the new iridectomy technique through a superior linear cut during cataract surgery. Albrecht was the son of

Table 1. List of tools used by Lodovico Brunetti: (U) used and (I) invented by Brunetti.

Cystotomy instruments (U)	Ophthalmology tools (U)	Rhinoplasty tools (U)	“Pocket bag” tools (U)	Rachiotomes for dissection (I)
Cystotome	Normal keratome	Pointed knife	Surgery knife	Type one rachiotome or cleaver model
Itineraries (probes): type one / two for adults and three / four for children	Sickle needle		Common twist tweezers	Type two rachiotome or carpenter model
Silver syringe	Daviel spoon		Two chisels “with fixed handle”	Type three rachiotome or single chisel model
Thompson’s screw lithotripter with a spoon	Spear knife		Generic probes	
			Grooved probe	



Figure 2. A) Surgery knife; B) Chisels “with fixed handle” and C) Generic probe (Charrière a Paris, 1840-50s), from the instrumental collection of the University of Padua.

Ferdinand von Graefe (1787–1840), a pupil of Joseph Beer in Vienna. (15) Von Graefe was also considered the father of modern scientific ophthalmology due to his innovative techniques and his knife was used, with small modifications, until the 1970s (Figure 4). (16-18)

Brunetti carried out also several cystotomies, describing in detail the instruments he used and their respective techniques. According to the Istrian physician, a good cystotome must be truncated and rounded, since a “button” or further obtuse extension was not useful and even inconsistent.⁵

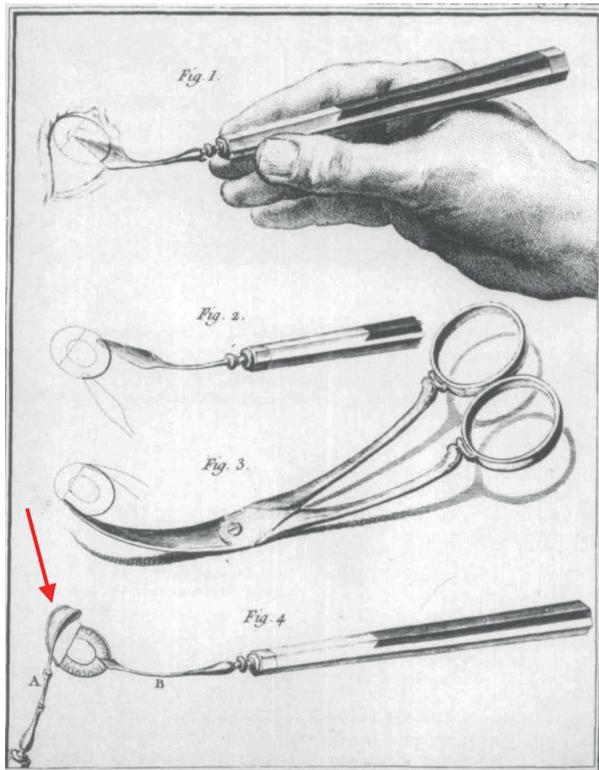


Figure 3. Daviel's instruments: Daviel's spoon is highlighted with an arrow (Modified from: History of Ophthalmology. Albert DM, Edwards DD, eds, 1996).

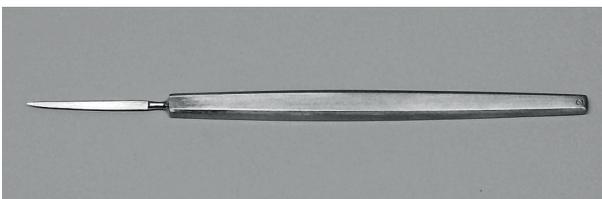


Figure 4. Von Graefe cataract knife.

These criticisms are reflected in the diffusion of a new buttoned cystotome with an inclined blade proposed by Pietro Loreta (1831-1889) in 1869 and based on Pierre Tarin (1735-1761) and Giuseppe Atti (1753-1826) previous modifications of the basic cystotome in the late seventeenth century (Figure 5). (18) Despite this tool was arousing great international interest in the field of cystotomy, Brunetti, on the other hand, did not find this innovation functional for practical use.

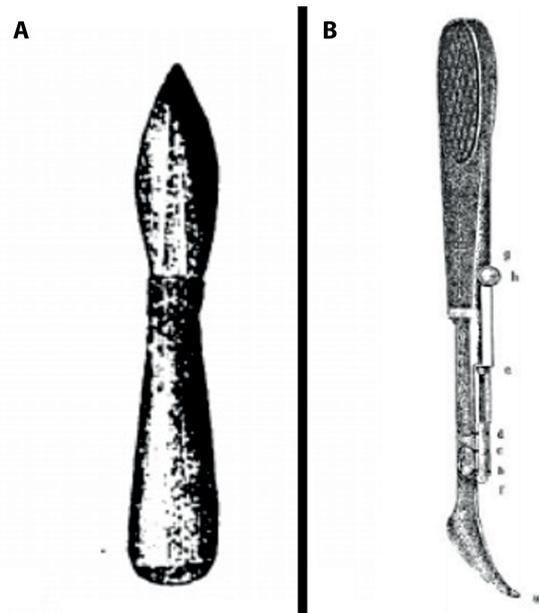


Figure 5. A) Simple cystotome, “truncated and rounded” (Modified from: *Lezioni sulla cistotomia*. Burci, 1863); B) One of Loreta's new buttoned cystotome with an inclined blade (Modified from: *Un cistotomo nuovo proposto per I vari metodi del taglio laterale*. Fava e Garagnani; 1869).

Along with the cystotome he used four different types of “itineraries” (probes), type one and two for adults and three and four for children. The probes had a nice deep groove and a blind bottom to better stop the cystotome, however, he did not consider them very useful, as they do not correctly form a right angle with the cystotome. Together with these probes, a silver syringe was used both to guide the operations and as a diagnostic tool. The last instrument mentioned among those used by Brunetti was a screw lithotripter, an instrument created in 1860 by the English surgeon Sir Henry Thompson (1820-1904). The lithotripter (or lithotrite) was inserted blindly into the bladder via the urethral route to search, grasp, and crush bladder stones with manual maneuvers. (19)

Today these tools mentioned by Brunetti to perform cystotomies are no longer in use since a further technological evolution brought new techniques and new instruments to perform a better and safer bladder surgery.

During his stay in Istria, Brunetti also performed a rhinoplasty operation using a pointed knife instead of the classic “pot-belly” model, to operate more precisely

and quickly. These were instruments comparable to current scalpels; the “pointed knife” was an ancestor of the straight blade scalpel, while the “pot-belly” model referred to an early form of the current pot-bellied blade scalpel (Figure 6). These tools were commonly used in the nineteenth century and Brunetti never had an interest in improving their form, but only tried to find new ways to better use them.

After these operations, Brunetti returned to Padua to continue his academic career as a professor of pathological anatomy, although he hoped that “his surgical knife would no longer sleep so long”. Together with the considerations about new and old medical tools and his surgical experiences, Brunetti also returned to Padua with new pathological specimens for his Museum: a tibial necrosis with sequestrum, an ovarian cyst with bones and teeth inside, four bladder stones and a cataract with calcification of the lens. These specimens and many others are still exhibited today as evidence of his surgical skills.

Conclusion

The report of the operations described by Brunetti paid particular attention to the instruments that are more suitable to the intervention and the technique used. This peculiar attention can also be seen in his anatomopathological work with not only the interest in a continuous improvement of the rachiotome he

conceived but also focusing on modern techniques of dissection. The comparison between the writings of Brunetti and the discovered instruments in the archives with a compatible chronological dating, confirmed the use of the aforementioned tools during Brunetti’s time at the University of Padua, albeit also the anatomical preparations of the Morgagni Museum are clear proof of his surgical and dissector skills. These tools evolved until the present day to a commercial version, still used for spine dissections at the University of Padova.

It is also worth mentioning that Brunetti’s education at the Vienna Medical School allowed him to maintain a connection with one of the foremost medical centers of Europe for the nineteenth century. It is also known that Brunetti visited the United Kingdom in 1867 and later was also honorary professor of the Kharkiv University between 1868 and 1869: it is possible to hypothesize that both through travel and through his linguistic knowledge, he was aware of technological developments in step with the times.

Indeed, through the instrumental innovations and the descriptions of the surgical operations, it is possible to note how Lodovico Brunetti continues to stand out for his modern and innovative vision of medical science with strong positivist influences, applying new methodologies and ideologies.

Concluding, the review of the report of Brunetti evidenced also how his specialization in various medical sectors has contributed to the quality of the service he offered both as a surgeon and as an



Figure 6. A) Modern potbellied blade scalpel and B) modern straight blade scalpel compared to D) Pot-belly knife and C) pointed knife (Stelzig An Prag, late XIX century), from the instrumental collection of the University of Padua.

anatomy-pathologist. In fact, nowadays the medical profession tends towards a hyper-specialization aimed at providing only some kinds of medical care. This has raised some questions about the real effects of such medical specialization and whether there is empirical evidence of any positive or negative outcome in the development of medical science and healthcare. (20)

One of the main disadvantages evidenced that modern specialized physicians tend to focus only on their areas of expertise, sometimes neglecting what does not belong to their specialization, which can lead to incorrect diagnoses and potentially adverse results.

Brunetti, on the other hand, treasured his experiences in various medical areas, since he stated that “*to improvise conveniently in surgery, a hand capable of obeying is not enough; it is the brain, which must be ready in any eventuality to give the appropriate orders to the hand, and it is the pathological anatomy who guides the brain. Medicine, both internal and external, without the aid of pathological anatomy is a building without foundations*”. (5)

Furthermore, his resumption of the “surgical knife” had benefited from his new studies as Professor of Pathological Anatomy, as it had enriched his approach to surgical practice since “*the anatomy-pathologist accustomed to reasoning with matter, knows how to push his investigations, where necessary, even beyond matter*”. (5)

Lodovico Brunetti’s interdisciplinary approach thus seems to confirm the need for an appropriate study career ranging across various medical specializations, as it can also bring more benefits in terms of health and medical care.

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