



Medicine in Television Series

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The Knick and Surgical Techniques

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The one thing Steven Soderbergh, winner of an Oscar for Best Director in 2001 for Traffic, had not declared when he announced his withdrawal from the film world in 2013 was that he was transferring his unique aesthetic to cable TV, to join a growing list of film directors who are investing their talent in this far less interventionist medium. This is what he has done in this historical drama that takes us back to the beginnings of modern surgery in a highly unconventional way. It is set in a New York hospital in the early twentieth century, and has an even more unusual protagonist: a reputable surgeon who is addicted to cocaine, played by Clive Owen (Closer, Children of Men). Its popularity has raised visibility for HBO's younger sibling: the action channel aimed at the male Cinemax audience.

The Manhattan Dispensary was a hospital founded in Harlem, New York, in 1862, which survived until 1979. Throughout its history it received different names, but was known from 1913 onward as the Knickerbocker Hospital. This is where the series' action is set, in 1900, taking as its main narrative referent the early steps of modern surgery and efforts to improve it technically.

To understand this period, one needs to briefly review the history of surgical evolution from its beginnings. Back then, surgeons were considered technicians, and were not always qualified, in contrast to doctors, who were the true healers. However, it could be said that both disciplines have always been closely related.

According to archaeological and anthropological studies, the earliest surgical techniques were employed to treat wounds and injuries. They included rudimentary cauterization, amputations and sutures, as well as cranial trepanning, dating back before 3000 BCE. Evidence shows that approximately 50% of individuals undergoing such operations survived.

Hindu medicine developed surgical techniques as diverse as methods for repairing the auricula of ears, rudimentary reconstructive rhinoplasty and even cataract operations.

In ancient Greece, Hippocrates was known as the paradigm of a doctor, to whom the def-

inition of a surgeon is attributed, along with his *modus operandi*: "The things relating to surgery are: the patient; the operator; the assistants; the instruments; the light, where and how; how many things, and how; where the body, and the instruments; the time; the manner; the place. The operator is either sitting or standing, conveniently for himself, for the person operated upon, for the light... The nails should be neither longer nor shorter than the points of the fingers; and the surgeon should practice with the extremities of the fingers, the index-finger being usually turned to the thumb; one should practice all sorts of work with either of them... endeavoring to do them well, elegantly, quickly, without trouble, neatly, and promptly."

Galen of Pergamon was known above all for being the personal physician of Emperor Marcus Aurelius. Nevertheless, he was considered a famous traumatologist, who repaired gladiators' wounds and described new surgical techniques, such as reconstruction of a cleft lip or palate.

Interest in surgery did not take root among Arabian doctors, except in the case of Al-Zahrawi, the author of a compilation treatise in which he included sections that referenced ophthalmological, obstetric and odontological techniques, as well as hernia repair and hemostasis (aimed at staunching hemorrhages).

The Middle Ages was not an especially kind period for surgery, given that its theocentric world view conceived of disease as God's scourge, with healing depending on a patient's repentance. This made surgeons a second-best resort compared to God's will. The founding of a guild of surgeons in London in 1368 is noteworthy. It aimed to separate these practitioners from barbers, who were the surgical precursors of doctors truly specialized in surgery as such. Nevertheless, the latter profession would continue their work of extracting teeth, blood-letting and minor surgery until the creation of the Royal Academy of Surgery in 1731, when that guild was finally prohibited from carrying out surgery. The second episode of *The Knick*, "Mr. Paris Shoes", makes reference to this when Thackery turns to Christiansen and says "You are legitimizing surgery, taking it out of the barber shops and into the future", in a clear allusion to its past.

Already in the sixteenth-century Renaissance, Vesalius gained fame as an anatomist, penning *De humani corporis fabrica*. The Spaniard Miguel Servet, who discovered pulmonary circulation, necessary for the oxygenation of the blood, was no less well-known. All these anatomical discoveries were favored by the freedom to conduct autopsies, which had been prohibited by the church and were punishable with death in the Medieval Period, should the practitioner be discovered.

In the Modern Period, a real expansion in surgeons' numbers occurred, bringing great progress to the specialization. The Frenchman Ambroise Paré is considered to be the father of modern surgery. He specialized in bullet wounds, designed prostheses for amputees, and made brilliant studies of Siamese twins. A curiosity from that period was the design of a special vehicle suitably equipped for the transportation of patients (the rudiments of today's ambulance, identifiable in *The Knick*'s first episode, "Method and Madness", as a horse-drawn carriage).

Not till the nineteenth century did the recognition and integration of medicine and surgery take place, with a victory over hemorrhaging, infection, and pain—the major obstacles this science had faced since its birth. Surgeons successfully managed to control hemorrhaging using hemostatic

clamps, which were modifications of the clamps that Paré used to extract bullets. Another great contribution was the study of coagulation and the discovery of blood groups, which enabled transfusions to be made, as can be seen in the final episode of the first season of *The Knick*, "Crutchfield". In the field of infection, in 1861, Semmelweis conceived the antiseptic principle with his work *Etiology, Concept and Prophylaxis of Child-bed Fever*, which would later be enlarged upon by Lister with his pulverizations of carbolic acid (phenol) and by Bregan with the introduction of steam sterilization. In 1887, Mikulicz-Radecki, established the use of a cap, surgical mask and cotton gloves during surgical operations, substituted from 1890 onward by rubber gloves. The fight against pain is highlighted by the arrival of etheral anesthesia through inhalation. Later, less toxic anesthetics would appear, and an important milestone was the introduction of tracheal intubation by Trendelenburg in 1871. So many professionals from that period developed significant surgical advances that it would be tedious to list them all.

And what can be said about the twentieth century? It is characterized by significant progress in diagnostic methods, such as diagnostic sonography, endoscopy, magnetic resonance, and so on, that enabled less aggressive surgery, which, along with minimally invasive laparoscopic techniques, made it possible to reduce certain complications in conventional surgery while improving patient recovery times.

Characters that become blurred with reality

The series' true protagonist and anti-hero, Dr. John Thackery, or Thack, becomes the head of surgical staff upon Dr. Christiansen's death.

While Thackery is a brilliant surgeon, he is also arrogant and ambitious, and a user of opium and cocaine. He is obsessed with being remembered in history for some innovative surgical procedure that would bear his name, to be remembered by future generations of surgeons for contributing to medical advances.

There is no doubt that this character is based on the figure of William Stewart Halsted (1852–



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1922), with whom he shares a great likeness. This man belonged to the glorious epoch of surgery's development. Thanks to his research on physiology and pathology applied to surgical techniques, he was considered the father of modern surgery, specifically North-American surgery. Trained in both the United States and Europe under the most notable surgeons of that time, upon returning to the US he joined the staff of several hospitals, achieved fame and prestige, and gave classes in surgery. He undertook trials in his pathology laboratory, perfected intestinal suture techniques and experimented with dogs to research the curing of wounds and thyroid surgery. In 1890, he was named first surgeon in chief of the recently inaugurated John Hopkins University Hospital, and in 1892, he was appointed first professor of surgery at the school of medicine.

Halsted used cocaine as an anesthetic and even went so far as to take it, to the point where he had to undergo a detoxification cure in 1886, just like Dr. Thackery.

His assistant in the operating theater, Miss Hampton, suffered from dermatitis on her hands, so Halsted commissioned the Good Year company to create some rubber gloves to preserve them. Shortly afterwards, their use was extended to surgeons' and to their assistants' hands to protect the surgical field. We will see whether in future seasons Dr. Thackery does the same, since at the moment no trace of gloves or surgical masks can be seen.

Both the real and the fictional character were innovators in several surgical techniques, notable among which is the repair of hernias. Furthermore, the real person developed a technique to combat breast cancer, still known today as Halsted's operation, consisting of a radical mastectomy of the gland and pectoral muscles, along with local and axillary ganglionic extirpation. The post-operative swelling of the arm after the aforementioned surgery is also known as Halsted Syndrome. There is an amusing situation in the seventh episode, "Get the Rope", where Thackery and Halsted meet face to face in the operating theater anteroom and are introduced by Dr. Christiansen, the former's mentor.

Another character who is, perhaps, based on a real person is Dr. Algernon Edwards. He is a black doctor, the top of his year, trained at Harvard and in Europe, who joins Knickerbocker Hospital as assistant chief surgeon, encouraged and supported by the hospital patrons, the Robertsons. He must contend with the racism that prevails in the hospital, both from his colleagues and from patients. Like Thackery, neither is he free from professional arrogance, which comes to the fore when he must face the daily disdain of his colleagues. We could say that Edwards is the alter ego of Daniel Hale Williams (1856–1931). Due to the racial discrimination reigning in that period, Afro-American citizens were banned from entering hospitals and black doctors were not employed as health personnel either. In firm opposition to this situation, in 1893, he decided to open the Providence Hospital and a nursing school, which became the first medical center with interracial staff in Pennsylvania. Likewise, in 1895, he co-founded the National Medical Association, a professional organization for black doctors as an alternative to the American Medical Association, which did not admit Afro-American members. A similar activity led Dr. Edwards to open his clandestine hospital in the Knick's basement. Another of his achievements was to conduct the first successful open-heart surgery, without having the benefit of transfusion or modern surgical procedures, by suturing the pericardium (the membrane enclosing the heart) of a man who had received a knife thrust in his thorax.

It is not so clear that other characters have been influenced by famous historic figures. The women in the series are notable for their strength and individual determination: Cornelia Robertson, daughter of the hospital's patron, Captain Robertson, who heads the Knick's social welfare office; Nurse Lucy Elkins, who keeps both her relationship with Thackery and her addiction to drugs secret; and Sister Harriet, a Catholic nun who runs the orphanage affiliated with the hospital, who also engages in clandestine nighttime activity consisting of practicing abortions, which were illegal at that time. The other characters, though not at all dispensable, have more of a chorus role that gives the storyline solidity.

Premises of the series and subplots

The main storyline follows Dr. Thackery, a racist figure, addicted to cocaine and devoted to his work to the point of exhaustion. It allows us to explore one of the golden periods of surgery in terms of medical advances, through Nurse Elkins, with whom he establishes a relationship, and through his colleagues, doctors Gallinger and Chickering. The latter two, who are innovative in spirit, admire Thackery unconditionally, and accompany him through several steps of this surgical revolution.

Certain details worth highlighting throughout the series are the scientific advances revealed, for example, the application of x-rays for diagnostic purposes, and the perfecting of surgical devices and techniques.

In parallel, the series explores other subplots, such as xenophobia formulated as humiliations of a racist nature that Algernon Edwards must bear throughout the entire series, and the need to create a secret hospital to treat black people.

The difficulty of managing a hospital that is no charitable institution, given that its patients pay yet come along because it services a population sector consisting mainly of workers, means that its manager, Herman Barrow, must invent Machiavellian schemes to correct his own errors. He can think of nothing better than asking the mafia for help, resulting in innumerable problems.

Analyzing surgical techniques

Syphilis and rhinoplasty

Syphilis is a disease caused by a bacteria called *Treponema pallidum* which tends to be sexually transmitted, as occurs to Abigail Alford, who contracts it from her husband in the third episode, "The Busy Flea". Syphilis patients can go through several phases. In the series we identify the ravages caused by benign tertiary syphilis, which appears from three to ten years after contagion and is characterized by the appearances of inflamed lesions, known as gummas, that evolve toward the death of the affected tissue. The loss of one's nose was one of the most common effects of syphilis in the nineteenth century.

This was such a frequent deformity that a specific "prosthesis" was invented for aesthetic reasons, such as the one Abigail wears, since the damage can extend to the total destruction of the nasal pyramid. Such a stigma demanded an answer, that of covering the orifice with reconstructive rhinoplasty.

In India, as early as 500 BCE, a technique had been developed to repair the nasal pyramids amputated from thieves or enemies. It consisted of constructing a frontal flap. Later, in the sixteenth century, Gaspare Tagliacozzi described a flap that was taken from the skin of the arm (nasobranchial) and sutured to the nasal stump, maintaining a bridge with the arm, which provided nutrients and was not cut until the flap had taken root. It is this latest technique Thackery employs on the nasal reconstruction of his former lover. It is possible that he chose this technique to avoid an obvious scar on the forehead of a beautiful woman such as Abigail. In the nineteenth century, the German surgeon Karl Ferdinand von Graefe recovered this technique and modified it, earning the title of the father of modern plastic surgery.

Inguinal hernia

The repair of defects in the abdominal wall has been a surgical procedure that has raised interest since Antiquity. Papyri from Pharaonic Egypt described the first technique for curing an inguinal hernia, consisting of bilateral castration. Without being so radical, over the years the use of trusses were recommended as a method of conservation to avoid surgery on the hernia, which was blighted by significant infection rates and the failure of the procedure (relapse). Once again, it was not until the nineteenth century that significant advances were announced.

Edwards develops a procedure in his clandestine clinic to correct this pathology, which was the true work of the Italian Edoardo Bassini, based on strengthening the posterior plane of the inguinal canal, with a low incidence of infection and relapse. A single case of early relapse resulting in death takes place in the third episode, "The Busy Flea", due to the patient not having



avoided physically strenuous activity as the doctor ordered. This encouraging result is what Edwards reveals to Thackery in the sixth episode, "Start Calling Me Dad", when Thackery discovers him in the basement. So a working relationship begins prompted by the interest he sparks. The technique is revealed in a meeting of the Metropolitan Surgical Society in the eighth episode, "Working Late a Lot". Halsted (once again) proposes a certain modification concerning Bassini's reconstruction of the internal ring, which must be as snug as possible, and he argues: "...If we could artificially produce tissues of the density and toughness of the fascia and tendon, the secret of radical cure of hernia can be discovered." Irving L. Lichtenstein took this idea and in 1986 created a "hernioplasty free of tension", where a polypropylene mesh is implanted on the anterior face of the internal oblique muscle and on the inguinal ligament, confirming its technical simplicity, early discharges and a lower incidence of relapse. Currently, hernias can be repaired using a laparoscope.

This type of surgery constitutes one of the most frequent operations a surgeon must undertake, and in all hospitals classic techniques such as Bassini's and Lichtenstein's are employed.

Appendicitis

The fourth episode, "Where's the Dignity?", makes reference to the difficulty of locating the cecal appendix and consequently performing an appendectomy or extirpation of the appendix, a procedure, viewers are assured, that nobody has survived to date. To our eyes this fact may seem curious, since acute appendicitis is the main cause of acute or surgical abdomen nowadays, and therefore, a relatively common procedure.

We have to go back to the sixteenth century to find the first description of the cecal appendix, given by Giacomo Berengaria of Carpi, and shortly afterwards the description of its inflammation during an autopsy. The first extirpation was conducted in the eighteenth century by Amyand, who removed an inflamed appendix located in an inguinal hernial sack (nowadays the infrequent situation of an acute appendicitis contained in the

hernial sack is known by the eponym of Amyand's hernia). Later, appendicular inflammation was known by the name of perityphlitis, and it was not until 1886 that Fitz, a professor of pathological anatomy, recommended appendicular removal in the case of inflammation after analyzing the post-mortem results of 257 patients suffering from this affliction.

The first extirpation is attributed to Thomas Morton, but we would have to wait for the arrival of McBurney, in 1888, who would go down in posterity as being the first surgeon to describe the clinical manifestations of such a popular pathology prior to its perforation, as well as the point of maximum abdominal hypersensitivity and the incision that bears his name, which is the one employed today when it is carried out as an open procedure, radically contributing to decreasing mortality, from 27% around 1900 to 0.6% today. In episode seven, "Get the Rope", Thackery gets into McBurney's skin: "By drawing a line and divining the midway point between the anterior-superior iliac spine and the umbilicus, parallel to the fibers of the external oblique, no matter what the size or sex of the patient... you will always find the appendix." Christensen, who is assisting him in surgery, adds: "The Thackery Point never misses", in clear allusion to McBurney's point. If we had to halt our arrogant protagonist with a "but", it would be to point out that the most precise location for making the incision is on the line described, but two thirds of the way from the belly button, not at its mid-point.

Cocaine: between anesthetic and addiction

In parallel to the development of surgery, for thousands of years humankind has experimented with substances for anesthetic and analgesic purposes, never quite achieving an optimum result, making surgery a bloody and painful procedure. Not until the early nineteenth century would the time be right for the progress of anesthetics, provided by the development of sciences such as physiology, physics and biology, as well as surgeons' greater sensitivity to their patients' suffering.

By 1831, three anesthetic agents were known and employed via inhalation: nitrous oxide, ether and chloroform.

The first to apply nitrous oxide for anesthetic purposes was a dentist named Horace Wells, who inhaled the gas and extracted a tooth without feeling pain. However, a later exhibition before his colleagues resulted in failure, since the patient began to scream and he was branded a fraud. One of his disciples, Morton, experimented with ether both on animals and on himself, achieving a loss of consciousness through inhalation. So in 1846, the first surgical operation without pain (the extirpation of an injury of a vascular nature located in the neck) was successfully carried out by a Dr. Warren, thanks to Morton's ether. A year later, Simpson, in England, self-experimented with chloroform with similar results, extending its use in Europe, while in the US, ether was preferred, which is the gas used in the series.

John Snow, from Edinburgh, was responsible for the development of anesthetic as a specialization when he successfully administered chloroform to Queen Victoria to ease her pain while giving birth to Leopold. Until then, it was customary that the narcosis was administered by the least expert member of the medical team. In fact, in the series, it is often controlled by the nurses.

In 1844, a needle for injecting fluids was designed. A decade later, Wood sought for a way to alleviate the pain caused by the neuralgia his wife suffered by injecting morphine. However, though morphine was not successful as an anesthetic, it was as an analgesic.

Cocaine is the alkaloid extracted from coca leaves. It was in 1884 when Koller applied it for the first time topically onto his cornea, achieving anesthesia. Its use was soon extended to fields such as urology and gynecology. Halsted and Hall managed a wide range of truncular blocks through injecting cocaine. The practical demonstrations were conducted on patients and even experimenting on themselves, which brought tragic consequences due to cocaine's highly addictive power, causing alterations in their social and professional behavior.

James Leonard Corning (1855–1923) and Karl Augustus Gustav Bier (1861–1949) were

pioneers in spinal anesthesia via medullary cocaineization. The latter also experimented on himself, and described the typical post-dural puncture headache due to the loss of spinal fluid during the anesthetic tap. This type of tap is given in the first episode of *The Knick*, when a patient, Mr. Gentile, previously operated on for secondary intestinal perforation of a polytrauma, presents septic shock due to the failure of the suture made, requiring a further surgical operation. As the patient presents a respiratory infection, general anesthesia by inhalation is not recommendable, so Thackery opts for a spinal block.

At this point, it is obvious that Thackery is addicted to cocaine, as has been evident from the first episode. Cocaine, the natural alkaloid extracted from coca leaves that was isolated for the first time in 1859, has among the most powerful stimulating effects on the central nervous system known, the devastating effects of which are now well-known today.

Initially, it was successfully commercialized as a remedy for specific common diseases: the flu, colds, toothache, etc. In this way, Mariani wine, with a cocaine base, was bottled and sold without problems. Among this wine's great defenders and consumers were Edison and Pope Leo XIII. A glass of this wine could contain between 35 and 70 milligrams of cocaine, the same as a line of cocaine. Coca cigarettes were also sold for throat afflictions, and drinks with cocaine and alcohol, such as the well-known Coca-Cola, for headaches, melancholy and hysteria (as can be appreciated in the ninth episode, "The Golden Lotus"). It was in 1909 when cocaine was substituted by caffeine in Coca-Cola's formula.

Such was the furore unleashed by cocaine that even Sigmund Freud began to study its use for treating neurasthenia, leading to an essay entitled *Über Coca*, in which he expounded its virtues for the cure even of alcoholism and opiate addiction. Only one German naturalist compared cocaine's secondary effects to opium, but until the second half of the twentieth century, cocaine was not classified as a narcotic substance.

Cocaine acts by exciting the cerebral cortex and producing a state of euphoria, which increases wakefulness and physical performance



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because it decreases one's feeling of tiredness. So Thackery employs it to avoid fatigue during his long sessions of study and surgery. Habitual consumption does not create physical dependence, but definitely psychological dependence. Periods of abstinence are not common, though not impossible.

So we can conclude that Thackery's inclination to consume cocaine is a response to three factors: firstly, its ubiquity in society of the time (at the start of the ninth episode there appears on screen, "In 1900, cocaine was regularly sold in pharmacies –no prescription needed", so easy was it to purchase); secondly, a lack of any awareness of its negative effects combined with the improved performance needed for his work; and thirdly, self-experimentation with the drug on his own body.

Racism in the hospital institution

Despite slavery being eliminated in the United States in 1865, racial segregation continued to be imposed in an unofficial yet real sense throughout the nineteenth and until the mid-twentieth century. In cities such as New York, black people were confined to specific neighborhoods, and could not live in affluent districts. Likewise, in the working sphere, black people were relegated to less-qualified positions, given that in most cases, they could not access university education. In the series, it is clear that there were hospitals for whites and for blacks. Dr. Edwards joins the Knick through the mediation of its patrons, the Robertsons, without having previously demonstrated his worth, albeit insofar as Dr. Thackery has not allowed him to. Taking a black doctor onto the hospital staff also meant many patients refusing to be treated by him, losing customers, and thereby lowering the income of the debt-ridden hospital. Faced with this situation, in the hospital basement, Edwards attends several medical cases of black patients, creating a clandestine hospital where not only does he undertake surgical procedures but also research, managing to perfect a surgical vacuum without the need to operate it using a crank handle. Likewise, the situation leads him to employ

unqualified staff, such as a hospital washerwoman to act as a surgical nurse.

It is in the seventh episode, "Get the Rope", when the cruelty with which black people are treated is brought to the fore. The conflict is served with the death of a white patient who has been attacked by a black man for having treated the latter's wife as a prostitute. Exhorted by the family of the deceased, the white community blames the black woman for events and a veritable revolt erupts in the city.

Epidemiology and typhoid fever

Ongoing mention is made through the episodes of a typhoid fever epidemic affecting some of New York's population of a higher social standing. This disease is caused by a bacteria called *Salmonella typhi*, whose bacilli are evacuated through the feces of asymptomatic carriers. They are disseminated through inadequate hygiene, thereby entering the water supply and foodstuffs, as occurs in the series. The pathogens enter the organism through the gastrointestinal tract, reach the bloodstream through the lymph vessels and cause inflammation of the lower part of the small intestine. All this generates fever, prostration and abdominal pain which can sometimes be due to an intestinal perforation, as happens with Cora Hemming in the third episode, where she requires surgery to repair it.

The investigative activities of Jacob Speight, an inspector from the Health Department, and Cornelia Robertson, following the epidemiological clues left by the typhoid fever, lead to the asymptomatic carrier: Mary Mallon, a cook who spreads the disease (even though she does not suffer from it) through her peach Melba. So it makes those who eat it sick. We have three elements here –the agent, host and environment– that comprise the epidemiological model current in the period that fitted the explanation of genesis of diseases in contrast to the simplicity that reigned in the eighteenth century, which explained the disease as the effect of a specific agent in an erroneous unicausal model.

This study of the distribution and determiners of health-related states or events in specific pop-

ulations, and its application in controlling health problems, is what we currently call epidemiology. This does not merely provide a causal explanation of the disease and its distribution, but also emphasizes its prevention, among other, more complex objectives.

Diagnostic instruments

X-rays

The German researcher, Röntgen, discovered this form of radiation by chance in 1895, when he detected a certain luminescence while he was handling vacuum tubes. He believed this was a form of previously undiscovered radiation, which he called x-rays because of their unknown nature, comparing them to an unresolved equation. Before presenting this discovery to the scientific community, he conducted several experiments, exposing different objects to this new radiation, among them a woman's hand, which constituted the first human x-ray.

X-rays are a type of ionizing electromagnetic radiation to which continued exposure can be dangerous, although, as is well-known, they have a wide application in medicine. Naturally, x-rays signified a revolution in medical diagnosis, and later, the science of radiation therapy was developed.

Röntgen was awarded the Nobel Prize for Physics in 1901 for this discovery, but declined to patent it despite Edison suggesting this course, saying he was bequeathing his discovery for humanity's benefit.

Nevertheless, Edison can be attributed with manufacturing the first commercially available fluoroscope, shown in the fifth episode, "They Capture the Heat", in which the device is presented to the doctors and manager of the hospital.

Another innovation that came from the inexhaustible Edison was the roller phonograph, an invention with no medical applications, but which Captain Robertson shows off in a party at his home, recording his own voice and playing it back later to the delight of his guests in the fourth episode, "Where's the Dignity?"

Zinberg and the intrascope

We have to wait until the eighth episode, "Working Late a Lot", to discover Dr. Levi Zinberg's luminous intrascope, the objective of which was to access the body's different cavities with the least invasiveness possible.

This gadget was known about in 1805, invented by Bozzini, who used a candle as a light source. But the invention passed unnoticed until in 1853, Desormeaux rescued it from oblivion. Thirty years later, Nitze perfected it, though it was still a rigid instrument, which caused patients a lot of inconvenience. In this manner one could view a bladder through the urethral channel without the need for open surgery.

The instrument was refined little by little throughout the twentieth century until it became the flexible endoscope, which enabled doctors to view the stomach. The next step was the appearance of the fiberscope, made of a fiber-optic bundle that allowed the transmission of light even if the end is curved, and to receive images, which was extremely useful for diagnosis, taking biopsies and conducting specific simple surgical procedures. The following step was miniaturizing the system.

Conclusions

Stanley B. Burns, a New York ophthalmological surgeon, was always interested in history, and in 1975 he began to collect old photographs on medical subjects. His collection now constitutes the Burns Archive, one of the most significant private holdings of old images in the United States, with over one million historical photographs. Midway between a circus show, due to the striking nature of some of the images, and graphic documentation of diagnostic means and treatments of the period, it enables us to delve into the darker side of life in the nineteenth and early twentieth centuries. It has therefore been a source of documentation on many occasions for film-makers, artists, editors, and so on, revealing a heroic age in medicine.

In *The Knick*, Soderbergh uses Burns' consultation, both personally, via collaboration on



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the TV sets, and through the contribution of this graphic collection. Furthermore, he possesses a collection that covers all the articles published between 1880 and 1930 of magazines such as *Annals of Surgery* and *Archives of Surgery*, documenting both the huge successes of the surgeons of the period, and their failures. So the first time filming took place in the operating theater, he had to reorder the staff sitting on the benches as was done of old: in the first row sat the old and distinguished doctors, and in the next sat the associate professors, assistants, etc. Another curious fact is that Burns had to teach the actors how to correctly hold the different surgical instruments such as the needle drivers, perform different suture types, and so on. Among other things, Burns has a photo that shows a device that was employed to cool a person's head, dating from approximately 1890. This consisted of a sort of cape surrounded by a rubber tube that acted as a type of coil, through which cold water was circulated. Thanks to this, the sixth episode, "Start Calling Me Dad", shows this device for cooling a patient's head used on little Lillian, who has meningitis. Furthermore, during the case of the theft of a medical item in the series, in the second

episode, a photograph belonging to Burns' collection can be seen.

Director Steven Soderbergh's manner of displaying all this could be described as hard and grim, comparing surgery to something akin to a butcher's shop, through fairly explicit images. However, one should bear in mind the difficult times, for both doctors and patients, in which the action develops, when such advances as we now take for granted did not exist. One should be aware of the need to experiment for surgery to evolve, sometimes on the experimenters' own flesh, at others on patients, and often on animals, generally dogs. These were not easy times, and they should be paid due merit.

Even if it is true that the various discoveries occurring throughout the series are real, we cannot say that the date on which these events took place is likewise true. However, we understand that this is a resource of the scriptwriters, Jack Amiel and Michael Begler. Not only does it give the series greater entertainment value, but it portrays the importance that this period had in order for surgery to advance to its current state of the art –a state in which we now have far more confidence than back then.