Thyroid Surgery Throughout History

Adrian Miron¹, Victor Strambu²

¹Department of Surgery, Elias University Emergency Hospital, Bucharest, Romania

²Department of Surgery, Carol Davila Clinical Hospital of Nephrology, Bucharest, Romania

Corresponding author:

Professor Adrian Miron
E-mail: dramiron@yahoo.com
Professor Victor Strambu
E-mail: drstrambu@yahoo.com

“Only the man who is familiar with the art and science of the past is competent to aid in its progress in the future.” – Theodore Billroth

Endocrine surgery is one of the youngest branches of general surgery, mainly due to the relatively late development of endocrinology as a separate domain of medical study. Even if modern procedures for endocrine pathologies be it malignant or benign, are nowadays more standardized, reproducible and fall into specific guidelines, the road to this point was not without its hardships. Certain notions regarding the role of the thyroid, parathyroid and adrenal glands have emerged in medical texts from ancient times, but surgery was considered troublesome and not worth the benefit, if the patient survived the procedure. This slow and exhausting trajectory saw an astonishing evolution during the end of the 19th century and positively bloomed in the beginning of the 20th, with the significant contributions of outstanding pioneer surgeons in both Europe and the US. The predicament nowadays has shifted more from archaic issues such as postoperative morbidity and mortality in patients suffering from endocrine dysfunctions to whether minimally invasive surgery should become the gold standard, and if it should – would it be laparoscopic surgery or would the robot take the spotlight?

The first literature mentions of goitre were reported in ancient China as early as 2700 BC, and even if the Chinese regarded such ailments as bygones and oddities, they did observe the positive effects of ingesting iodine-rich foods such as seaweed in treating these large neck masses (1). Many anatomists and great artists studied, described and illustrated the thyroid gland,

the name itself derived from the ancient Greek word for “shield” (thyreos) and various famous paintings depict large goitres – from Andreas Vesalius to Sandro Botticelli, Albrecht Dürer to Leonardo da Vinci and Michelangelo Buonarroti, but understanding of such afflictions was lacking for centuries on end (2,3). The Arthorva Veda of the Hindu also mentions various exorcism rituals for people with goitre around 2000 BC, while the word “goitre” itself is derived from the Latin “guttur” (throat), used most likely by Romans around the time of Julius Caesar, after they observed a frequency of this ailment in Gaul (4). Thyroid-related orbitopathy, although classically attributed to Basedow and Graves, was in fact first described around 1000 AD by a noteworthy Persian physician, called Avicenna, and another around 1100 AD - Al-Jurjani (5).

It was also a Moorish surgeon who first performed a successful thyroidectomy using a crucial incision in 952 AD (meaning the patient survived surgery without exsanguination, due to careful ligation of all arterial branches), and his name was Albucassis (Abu Qasim Khalaf Ibn Abbas Al Zahrawi) (6). Unfortunately, this prodigious technique was lost thereupon and the event remained a singular, rarely-referred to for many years to follow.

The Medical School of Salerno, Italy, in the 11th and 12th century pondered upon the thyroid and its functions and disorders extensively, with Roger Frugardi – also known as Rogerius Salernitanus – proposing various pharmacological remedies, but also the “seton” method for when the former proved ineffective; he bound two fine threads wired to hot iron wires were ligated at the base of the neck to reduce goitres and if this failed, surgical excision of individual nodules was performed with a scalpel, but results were nevertheless disappointing, most times resulting in the death of the patient (7). Interestingly, it was also Italian Bartholomaeus Eustachius who first coined the term “glandulam thyroideam” and described its bilateral, bilobed structure, its isthmus and considered it a gland, but that occurred almost five hundred years after the Salernitan studies, in the 16th century (8).

For years on end, thyroid surgery was considered ill-fated beyond repair, any and all attempts at the removal of the gland resulting in impressive hemorrhage, thrombosis of the jugular and subclavian veins, injury of the esophagus, trachea, vagus nerve, sepsis, suffocation and was generally thought of as a preposterous endeavour for both patients and physicians. After the imprisonment of a French surgeon following a series of blighted surgeries in 1646, so ludicrous was the thought of trying to cure thyroid ailments with any kind of interventions that the French Academy of Medicine banned the procedures entirely in 1850, when reported postoperative mortality was around 41%(9,10). Around 1866, the famous American surgeon Samuel D. Gross ominously said “But no sensible man will, on slight considerations, attempt to extirpate a goitrous thyroid gland. If a surgeon should be so adventurous, or fool-hardy, as to undertake the enterprise, I shall not envy him.... Every step he takes will be environed with difficulty, every stroke of his knife will be followed by a torrent of blood, and lucky will it be for him if his victim lives long enough to enable him to finish his horrid butchery” (11).

Nevertheless, on May 20, 1791, French surgeon Joseph Pierre Desault operated on 20-year-old Jaqueline Hyon, who had a large cyst occupying most of her right thyroid lobe – he exposed the gland through a longitudinal median skin incision in the anterior cervical area, then double ligated the thyroid vessels, dissected the cyst all the way around and grasped it to remove the lobe in its entirety; despite developing a subsequent surgical site infection, the patient lived with no major complications following this innovative technique (12). Still, it was a singular occurrence in a sea of failed attempts that preceded and followed this major success.

We must note, notwithstanding, that this was a time before such commonly used accessories as general anaesthesia, antiseptics, or even fine surgical instruments – including haemostatic forceps. All these breakthroughs happened quite unexpectedly over just a few years – J.C. Warren introduced general

anaesthesia in 1846, Lister advocated anti-sepsis in 1867, Pasteur further favoured asepsis and instrument sterilization, while adequate control of blood vessels was achieved after soaring widespread use of the forceps at the end of the 1870s (10). During the following half-century, slow and steady surgical progress was made in France, the UK, Switzerland, Germany and the US, but it mostly consisted of observing certain correlations between the size and/or type of thyroid tumours and their influence on other organs, such as flattening of the trachea in voluminous goitre with prolonged pressure on the airway or exophthalmia, tremor and sweating in large, bloody goitres. Use of the haemostatic forceps, transversal incisions, double ligation of both the superior and inferior pedicles in one-sided afflictions were also mentioned for the first time during the beginning of the 19th century, as was the benefits of the newly-discovered iodine in thyroid disorders, but the perspective of a successful series of thyroidectomies still seemed unattainable (13).

All these efforts paved the way for great and formidable progress in the field of general surgery and that finally included thyroid surgery as well.

The first to achieve real progress was, of course, one of the most prolific surgeons in history, not only due to his personal accomplishments, but also due to the success of his pupils, and that person was Theodor Billroth. Despite his initial lack of success during his tenure at the University of Zurich (8 of his 20 patients died perioperatively), he later reprised his efforts, taking advantage of all the innovations that had been undertaken in daily practice. Consequently, the mortality he reported only 6 years after, in Vienna, was less than 10% (14). His technique was still flawed in that he was quick to extirpate the gland with little or no regard for careful and meticulous blood vessel ligation, which often resulted in postoperative tetany.

However, it is undoubtedly Theodor Kocher who is most associated with this field and has been deservedly designated as “the father of thyroid surgery”. A pupil of two great

surgeons, Billroth and Langenbeck, he became Professor of Surgery at the University of Bern at just 31, and soon presented an astounding series of 101 successful thyroidectomies with an impressive mortality rate of just 12.8%, which 250 cases later dropped to 2.4% (15). He was awarded the Nobel prize in Medicine for his contributions to the field of surgery – the first surgeon to be presented with this honour – and, in 1917 at the age of 76 he made his final appearance before the Swiss Surgical Congress and presented his life’s work of almost 5000 thyroid procedures with a mortality rate of approximately 0.5% (15,16). During his tenure at the University of Bern, he did not encounter the postoperative issues Billroth had struggled with, mainly due to his minute and attentive extra capsular dissection technique which allowed for the preservation of the parathyroid glands. He did, however, notice what we now know are the symptoms of hypothyroidism, because the downside of this skilful operative method was complete excision of thyroid tissue – he called this cachexia strumipriva. He did not find a way around it and consequently decided against standard total thyroidectomy for benign disease, instead supporting lobectomies and only excising the entire gland in cases of malignancy or important compression on the trachea (11,16,17).

Following in the footsteps of these two great surgeons, whom he observed during fellowships in Vienna and Bern, William Halsted went back to the US and in 1889 took over as Professor at Johns Hopkins Hospital. He had concluded after careful analysis of both techniques as well as doing experiments on animals and in the laboratory that thyroid surgery should be founded on a profound knowledge of anatomy, but it should be guided by the principles of physiology. He knew that the parathyroid glands should be kept and insisted on careful and scrupulous dissection of their blood supply and ultraligation of the thyroid pedicles (18). He was also the first to introduce the practice of wearing thin rubber gloves during surgery. In 1920 he published “The Operative Story of Goiter: the author’s operation”, where he beautifully stated that

“The extirpation of the thyroid gland for goiter typifies perhaps better than any other operation the supreme triumph of the surgeon’s art” (19).

One last notable mention goes to Thomas Peel Dunhill, who at the beginning of the 21st century decided to take on the challenge of finding a way to treat patients with thyrotoxicosis. He had concluded from observing his fellows’ work that lobectomies were useless and unsuccessful so he revived the concept developed by Mikulicz, another one of Billroth’s students, of subtotal thyroidectomy. Using this practise, he managed a wondrous 230 surgeries for exophthalmic thyreotoxic goitre and only 3% mortality rate (20,21). He also described sternotomy as a valid step in excising voluminous intrathoracic goitres (14).

Further medical innovations and progress, such as the discovery and quick inclusion of ultrasound in clinical practice, computerized tomography, fine needle aspiration biopsy, intraoperative nerve monitoring, medical hormone replacement therapy, as well as minimally invasive surgery have made thyroid surgery one of the least risky and complicated endeavours of today’s time. Nevertheless, one must never underestimate the skill and precision needed in order to achieve a good result and should always bear in mind the struggles and hindrances of the past.

Conflict of Interest

The authors declare no conflicts of interests.

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