

The contribution of P.I. Dyakonov and his scientific school in the development of esophageal surgery

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One of the special features of Russian medical science is the existence of large scientific schools headed by leaders of promising research fields who develop traditions of continuity and consistency in their students' education and training. At the turn of the 19th and the 20th centuries, Professor P.I. Dyakonov (1855–1908) developed a scientific school of esophageal surgery in Russia. While working on many important problems in surgery and its related disciplines, Dyakonov paid special attention to one of the most neglected issues in the early 20th century – the timely treatment of cancer and scar strictures of the esophagus. Professor Dyakonov was one of the pioneers of thoracic surgery in Russia – in a short period of time he created a large scientific school of surgeons and morphologists. At the Dyakonov-led department of topographic anatomy and operative surgery, and later at the hospital surgery clinic at Imperial Moscow University, his students – 23 of whom defended their doctoral dissertations – published more than 360 scientific papers. In the hospital surgery clinic, from 1903 to 1908, Dyakonov treated 134 patients with tumors and 13 with scar tissue obstruction of the esophagus (115 of these patients were prescribed gastrotomy operations). No Russian clinic had such a track record at the time. Dyakonov made four attempts at resectioning the esophagus to treat cancer. Further development of Dyakonov's scientific school took place during the 20th century. In this paper, we investigate the contribution of Dyakonov and his students to the development of esophageal surgery.

Keywords: *history of surgery of the esophagus, esophageal surgical development in Russia in the early 20th century, the contribution of P.I. Dyakonov and his students*

For quotation: *Bogopolsky P.M., Kabanova S.A. The contribution of P.I. Dyakonov and his scientific school in the development of esophageal surgery. History of Medicine. 2016. Vol. 3. № 4. P. 322–328.*

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Biography of P.I. Dyakonov

One of the peculiarities of Russian medical science is the existence of large scientific schools which are headed by their founders and leaders of promising research areas, who develop traditions of succession and consistency in mentoring their students. The unique scientific school of the surgery of the esophagus of Professor P.I. Dyakonov was established in Russia between the end of the 19th century and the beginning of the 20th century.

Petr Ivanovich Dyakonov (see illustration) was born in Oryol on 2 June (Old Style Calendar) 1855 to the family of a lawyer. At the age of 15 in 1870, he graduated from the gymnasium and tried to enroll in the law faculty at Saint Petersburg University. However, he was not accepted due to his tender age. In 1871, P.I. Dyakonov returned to Saint Petersburg and enrolled in the Medical Surgical Academy. It was there that he joined one of the revolutionary societies whose members were conducting awareness-raising work among workers and soldiers. While a student, Dyakonov was arrested twice (in the autumn of 1874 and late 1875), and in 1876 he was exiled to Veliky

Received: 27.10.16

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Ustyug. In the spring of 1877, after the outbreak of the Russo-Turkish war, P.I. Dyakonov was conscripted into the field army and, as a political exile, he was sent to a penal battalion as a common soldier. After being noted by the commanders for his bravery in the field, P.I. Dyakonov was allowed to serve as a paramedic. After the war, P.I. Dyakonov completed training at the Medical Surgical Academy. However, because he was not allowed to live and work in the capital cities, after graduating as a physician in 1879, P.I. Dyakonov and his wife moved to the Bolkhovskiy District of the Oryol Governorate, where he served as a zemstvo doctor. In June 1880, P.I. Dyakonov transferred to the Oryol Governorate zemstvo hospital, where he first worked as acting and then full-time hospital physician and held this post until the end of 1883. During his time in Oryol, P.I. Dyakonov not only proved himself as an excellent clinician, but also published his first four scientific papers in the *Vrach* ("Doctor") newspaper and the *Meditsinskoe obozrenie* ("Medical Review") magazine. With his heart set on scientific work, P.I. Dyakonov managed to obtain permission to live in Moscow under police supervision. Here he worked as a health inspector while also working at an eye hospital. In 1887 Professor A.A. Bobrov offered P.I. Dyakonov a job as an assistant prosector at the Institute of Operative Surgery and Topographic Anatomy of Imperial Moscow University (IMU). It is from this time that the brilliant academic career of P.I. Dyakonov took off. In 1888, he defended his Ph.D. thesis titled "Statistics of blindness and some data on the etiology of blindness among the Russian population" and had the title of privatdozent conferred on him. In February 1890, P.I. Dyakonov was appointed prosector of the department of operative surgery and topographic anatomy of IMU, and was soon allowed to lecture students. At the same time P.I. Dyakonov became a consultant in several charity medical institutions in Moscow. In 1893, P.I. Dyakonov was elected head of the department of operative surgery and



Petr Ivanovich Dyakonov (1855–1908).
Photograph from the museum of the Academic B.V. Petrovskiy Russian Scientific Center of Surgery.

topographic anatomy of IMU and received the title of extraordinary professor, becoming the first zemsky doctor to become a professor of surgical sciences. P.I. Dyakonov did his practical surgical work at Basmany Hospital and several other hospitals in Moscow. In September 1901, Professor P.I. Dyakonov took over as head of the hospital surgery clinic of the IMU and in August 1903 he was named full professor. P.I. Dyakonov died of a serious heart disease on 3rd January 1909 (21st December 1908, old style) aged 53. He was buried in the Vagankovo Cemetery [1] in Moscow.

Research work of P.I. Dyakonov and his students on surgery of the esophagus

The surgery of hernia, the gall bladder and bile ducts, plastic surgery, pediatric surgery, oncology, urology, neurosurgery, traumatology and orthopedics, as well as issues relating to surgical pain treatment, antiseptics and aseptics [1] are normally referred to as the primary areas of P.I. Dyakonov's research work. That is fair enough, although by addressing many pressing issues concerning surgery and related subjects, P.I. Dyakonov paid much attention to one of the most poorly studied problems at the turn of the 20th century – surgical treatment of cancer and the cicatricial strictures of the esophagus.

Professor P.I. Dyakonov became one of the first leaders in local surgery, having established, over a short period of time, a large scientific school of surgeons and morphologists, the most prominent representatives of which were F.I. Berezkin, V.R. Braitsev, N.K. Lysenkov, N.I. Napalkov, F.A. Rein, N.N. Terebinsky, A.V. Tikhonovich and V.R. Khesin. In the department of topological anatomy and operative surgery and then in the hospital surgery clinic of IMU, which were headed by Professor P.I. Dyakonov (in 1893–1901 and 1901–1908, respectively), more than 360 researches [1] were conducted by his students, 23 of whom defended Ph.D. theses.

P.I. Dyakonov was one of the pioneers of thoracic surgery in Russia. Working on corpses, in 1893 he developed an extra-pleural approach to mediastinum organs through resection of the costal arch from the left-side and separation of the pleural sac from the diaphragm. In 1898 he performed lower lobectomy with separate ligation of the artery, vein and bronchus [2, 3] for the first time ever. In 1905, P.I. Dyakonov performed the first successful trans-thoracic operation for diaphragmatic hernia in Russia. For chronic pleural empyema, he proposed to thoracoplasty with preservation of soft tissues of the intercostal space by considerably modifying the existing Schede operation [1, 2, 4, 5].

Literature data and archival sources show that P.I. Dyakonov was interested in the problem of the surgery of the esophagus throughout his academic work. Despite that P.I. Dyakonov himself never published work on the surgery of the esophagus, he guided the efforts of his students towards solving all pressing aspects of this problem. When P.I. Dyakonov was still head the department of topographic anatomy and operative surgery at IMU (1893–1901), his student A.V. Starkov performed and published in 1901 work based on the results of postmortem examination of 67 bodies, of which 10 were corpses of patients who had died of esophageal cancer [6]. Based on his research, A.V. Starkov concluded that I.I. Nasilov's¹ posterior extrapleural approach was unsuitable for radical surgery with malignant esophageal affection, since in most cases he found the spread of tumours to posterior mediastinum structures, as well as lymph node metastases near the tracheal bifurcation and in the abdominal cavity. One of the important conclusions drawn by A.V. Starkov was that the operation for esophageal cancer should provide a free approach not only to the tumour itself, but to the mediastinal lymph nodes as well, in order to enable their removal in a single unit with the esophagus. The need for lymphadenectomy for esophageal cancer in order to increase oncological radicalism of the

¹ This approach, being one of the global Russian preferences in the field of the surgery of the esophagus, was proposed and developed in experiments on corpses by I.I. Nasilov in 1888, and from then on it was tested in experiments and clinical practice on numerous occasions.

operation was proven at the beginning of the 20th century at the hospital surgery clinic at IMU under the leadership of P.I. Dyakonov.

According to P.I. Dyakonov's students V.P. Voznesensky (1908) and V.Yu. Slavyanis (1908), 134 patients with tumours and 13 with cicatricial esophageal obstruction were treated in the hospital surgery clinic from 1903 to 1908, of whom 115 were operated on (they were given PEG tubes) [7, 8]. Not one clinic in Russia had ever had that experience at that time. Based on case records in the archive of the Academic B.V. Petrovsky Russian Scientific Center of Surgery that we studied, patients with diseases of the esophagus were now being regularly admitted for treatment at the hospital surgery clinic of IMU beginning 1901, which is after Professor P.I. Dyakonov took over. Besides gastrostomy operations performed between 1903 and 1908 which were cited by V.P. Voznesensky and V.Yu. Slavyanis, we found in the archive the case of a patient with a combination of cicatricial affection of the esophagus and the stomach on which jejunostomy² was performed in 1907. Besides case records of patients suffering from cancerous and cicatricial oesophageal obstruction, there are also cases of two patients suffering from cardiospasm, which at that time was called "*dysphagia amyotactica*".³ These patients were treated by gullet bougienage with a thick gastric tube, as well as psychotherapy and prescription of a special soft diet.

There had been patients with diseases of the esophagus at the hospital surgery clinic at IMU before Professor P.I. Dyakonov took over, albeit very rarely. The archive at the Academic B.V. Petrovsky Russian Scientific Center of Surgery contains files of case records from 1894 to 1900, which was the period when the department of hospital surgery at IMU was headed by

² The hospital surgery clinic of Imperial Moscow University. Case records for 1907. Case record No. 2589 of patient S., 20 years old (admitted 16 October 1907). Diagnosis: Cicatricial esophageal stricture (post-ambustial). Archive of the Academic B.V. Petrovsky Russian Scientific Center of Surgery.

³ The hospital surgery clinic of Imperial Moscow University. Case records for 1901. Case record of patient B. (admitted 10 October 1901). Diagnosis: *Dysphagia amyotactica* (cardiospasm). Archive of the Academic B.V. Petrovsky Russian Scientific Center of Surgery.

the founder of one of the largest local schools of surgery – Professor L.L. Levshin (whose student, A.A. Kiter, was also a student of the great N.I. Pirogov). We found five case records of patients with oesophageal obstruction during this period.⁴ Two of the five patients were given PEG tubes (these patients were operated on by S.I. Spasokukotsky – a student of L.L. Levshin). Another patient was treated for cardiospasm by bougienage. However, we found no scientific publications on this subject by members of the department of hospital surgery of IMU during this period.

P.I. Dyakonov made eight attempts at esophageal resection for cancer, but managed to complete this operation only once. In March 1904, Professor P.I. Dyakonov performed esophageal resection for cancer of the upper thoracic segment, using a combined neck and posterior mediastinal approach, which apparently was an improvisation during the operation. Judging from the patient's clinical record and the operation report cited in V.Yu. Slavyanis' dissertation [8], localization and spread of the tumour during examination were not accurately established. The operation began with exposure of the esophagus on the neck via a left-side approach. However, it turned out that only the upper edge of the tumour could be reached through this wound. P.I. Dyakonov then used I.I. Nasilov's upper left-side approach with the crossing of rib I via Faure's⁵ method and excision of ribs II-V between the backbone and shoulder blade. A 5 cm long portion of the esophagus affected by the tumour was mobilized, resected and removed through the neck wound. The lower section was pulled into the wound on the back and the operation ended with formation of an end esophagostoma on the neck. Unfortunately, the patient died of "rapid cardiac failure" the morning after the operation. P.I. Dyakonov therefore basically performed an operation which was later performed through a trans-pleural intercostal approach by the

V.D. Dobromyslov or Mikulicz-Sauerbruch method.⁶

From 1901–1908 under the guidance of Professor P.I. Dyakonov, several innovative works were performed on cancer and post-ambustial cicatricial strictures, as well as diverticula of the esophagus (V.N. Pavlov-Silvansky, V.M. Grinshtein, A.V. Sudakevich, V.Yu. Slavyanis, V.P. Voznesensky), which were published in the "Works of the Prof. P.I. Dyakonov Hospital Surgery Clinic" (15 volumes of this unique publication were released). Diagnostic and therapeutic esophagoscopy was developing successfully in the hospital surgery clinic of IMU during this period, and the accumulated experience (more than 300 esophagoscopies – the highest number of procedures in Russia at that time, 47 of which were performed with debridement of the esophagus) was presented in R.I. Venglovsky's monograph published in 1905 [9]. A.V. Sudakevich's paper, in which he summarized the experience of using diagnostic esophagoscopy with diverticula of the esophagus, came out in 1908 [10].

V.Yu. Slavyanis' dissertation "Esophageal Cancer" was published by Professor P.I. Dyakonov's clinic in 1908. Based on the results of numerous anatomical examinations of corpses, Slavyanis established that the upper part of the thoracic esophagus is easier to resect using I.I. Nasilov's posterior extrapleural approach, while the lower part of the organ is more accessible via V.D. Dobromyslov's trans-pleural approach [8]. Professor P.I. Dyakonov's clinic therefore developed various surgical approaches to the thoracic esophagus – not only by the extra-pleural, but by the trans-pleural approach as well (with certain indications), i.e. an approach many surgeons at that time considered impossible for a variety of reasons. However, surgeons never abandoned I.I. Nasilov's posterior extra-pleural approach despite all of its well-known shortcomings.

The work of another student of P.I. Dyakonov – V.P. Voznesensky⁷ – was

⁴ The hospital surgery clinic of the Imperial Moscow University. Case records for 1897. Case record for patient R., 33 years old (admitted 10 January 1897), diagnosis: *Stricturea oesophagi* (carcinoma). Archive of the Academic B.V. Petrovsky Russian Scientific Center of Surgery.

⁵ Faure – French surgeon who improved I.I. Nasilov's upper approach by adding the crossing of rib I, which provided additional space in the wound.

⁶ Dobromyslov and Mikulicz approach – ordinary intercostal cut in intercostal space IV-V; the "normal" Sauerbruch approach included addition to said approach in the region of its back angle of a vertical section with crossing of 2-3 overlying ribs.

⁷ In 1941–1953 Professor V.P. Voznesensky headed the department of general surgery of the 2nd I.V. Stalin Moscow Medical Institute.

devoted to further research of the possibility of using I.I. Nasilov's approach in operations for cicatricial esophageal strictures. This work was published in 1908 [7]. In experiments on corpses, V.P. Voznesensky developed a new operation which comprised exposing the esophagus using I.I. Nasilov's method, removing small intestines from the abdominal cavity into the posterior mediastinum through an additional thoracic trans-diaphragmatic approach according to the R.H. Vanakh⁸ method, and its anastomosis with the upper thoracic esophagus end-to-end. V.P. Voznesensky pointed out that he proposed this method to treat cicatricial esophageal strictures, and D. Biondi's operation of 1895 served as the prototype of his operation. However, unlike D. Biondi's operation, V.P. Voznesensky's operation was extra-pleural. V.P. Voznesensky doubted it was possible to perform his esophagoplasty method in the clinic due to its technical complexity. However, it should be stressed that this esophagoplasty method was developed in an experiment for the first time ever. This method of guiding the intestines for anastomosis with the esophagus was described by A.G. Savinykh in 1938. However, he used his unique trans-diaphragmatic (transhiatal) approach to the esophagus [11].

V.P. Voznesensky was the first to study in detail the structural peculiarities of the feed vessels of the small intestines as applied to esophagoplasty. When performing esophagoplasty on dogs using the Roux method, he was the first to describe hyperperistalsis of the small intestines as a symptom of transplant ischemia. V.P. Voznesensky was also the first to suggest making an open subcutaneous channel on the thoracic wall for placing an enteric artificial esophagus under direct vision in order to avoid damage to the feed vascular arcade.⁹

V.P. Voznesensky was the first to propose end-to-end double-row embolic esophago-intestinal anastomosis and used it in intrapleural esophagoplasty in an experiment. The following should be said with respect to the last preference. In 1969, K.N. Tsatsanidi and A.V. Bogdanov [12] pointed out that "spill-proof inkwell" type embolic

esophago-intestinal anastomosis was first described and theoretically substantiated by N.F. Berezkin in 1937 [13]. However, these publications make no reference to the work of V.P. Voznesensky who, in 1908, wrote: "When operating on the corpse, connection of the esophagus and the intestine is difficult due to the mismatch of their cross-sections and wall thickness, as well as the absence of a serous coat on the esophagus; this is why it is quite difficult to achieve complete hermetism when joining their walls. To avoid the cross-sectional mismatch, I cut out a triangular section from the wall of the intestine; after suturing the edges of the cut, the upper end of the intestine took up the shape of a truncated cone, the apex of which was joined to the intestine; the esophagus is then pushed into the intestine at a known depth, like the finger of a glove, and then sewn up with a circular suture" [7, p. 20].

Details of the method and technique of forming the oesophago-intestinal anastomosis might differ for V.P. Voznesensky, N.F. Berezkin and K.N. Tsatsanidi, but the preference of creating the principle for such embolic anastomosis should undoubtedly be given to V.P. Voznesensky.

The research conducted by Professor P.I. Dyakonov and his students at the turn of the 20th century, therefore, covered the entire range of diseases of the esophagus.

After the sudden death of P.I. Dyakonov in 1908, the department of hospital surgery at IMU was briefly headed by his student N.I. Napalkov, and from 1910 to 1934 by Professor A.V. Martynov, whose arrival marked a significant change in the direction of research in the department, and the research on the surgery of the esophagus ended. Unfortunately, V.P. Voznesensky's promising developments on posterior mediastinal esophagoplasty¹⁰ also stalled.

Nevertheless P.I. Dyakonov's students continued the research on the subject. In 1915 R.I. Venglovsky¹¹ published Russia's first major monograph on the surgery of the esophagus in which he summarized data from foreign scientists and the rich experience of P.I. Dyakonov's

⁸ This approach was proposed in 1898 by Russian surgeon R.H. Vanakh for opening subdiaphragmatic abscess.

⁹ Such a method of performing a transplant on the neck was used for the first time at the I.I. Grekov clinic in 1916.

¹⁰ In 1913 V.P. Voznesensky defended his Ph.D. thesis "On the annular duodenal ulcer", after which he left the hospital surgery clinic of IMU.

¹¹ Professor R.I. Venglovsky was head of the department of topographic anatomy and operative surgery at IMU from 1911 to 1917.

clinic. In this monograph, R.I. Venglovsky gave a detailed description of etiology, pathogenesis, peculiarities of diagnosis and methods of conservative and surgical treatment of all diseases and injuries of the esophagus known at that time, as well as their consequences [14].

Another student of P.I. Dyakonov – Professor V.R. Braitsev – was the founder in Russia of total cutaneous esophagoplasty via Bircher’s method, which he considerably perfected [15]. V.R. Braitsev also studied the possibility of surgical treatment of cardiospasm and was the first in Russia to perform the Heyrowsky operation for this disease. In 1922, he demonstrated the successful result of extramucosal cardioplasty via Girard’s method [16]. While working in Yaroslavl [17], Professor A.V. Tikhonovich, a student of P.I. Dyakonov, presented his own modification of the Heyrowsky operation at the 18th Conference of Russian Surgeons in 1926. Another student of P.I. Dyakonov – Professor V.L. Pokotilo – did a lot to improve total enteric esophagoplasty via the Roux-Gertsen method and between 1926 and 1928 published accounts of successful operations, the subsequent operative time and good long-term results [18, 19].

Hence the ingenuity of approaches to solving relevant aspects of the problem of surgical treatment of benign and malignant diseases of the esophagus, the large volume of scientific research conducted on this subject by members of the department of hospital surgery at IMU under the guidance of P.I. Dyakonov, the large number of treated patients and the significant number of operations, the availability of students who creatively furthered the views of their teacher and mentored their own students, enables one to speak of the establishment of P.I. Dyakonov’s scientific school of the surgery of the esophagus at the beginning of the 20th century. P.I. Dyakonov’s scientific school possesses a global priority in the form of posterior

mediastinal esophagoplasty with small intestines with “spill-proof inkwell” type end-to-end embolic oesophago-intestinal anastomosis, developed for the first time ever in an experiment (V.P. Voznesensky, 1908).

Conclusion

P.I. Dyakonov’s role as the leader of the scientific school consisted of organising extensive research on anatomy, experimental and clinical surgery of esophageal cancer and studying the possibility of diagnosing and treating benign diseases of the esophagus. This was reflected in the primary areas of the research of P.I. Dyakonov’s students, such as the study of surgical approaches to the thoracic esophagus, the development of methods and techniques for the resection of the esophagus with cancer and esophagoplasty methods with cicatricial strictures, as well as methods of diagnosing and treating cardioplasm and diverticula of the esophagus. The results of these researches were presented in the work of P.I. Dyakonov’s students – A.V. Starkov (1901), R.I. Venglovsky (1905, 1915), V.P. Voznesensky (1908), V.Yu. Slavyanis (1908), A.V. Sudakevich (1908), and in the Soviet era – V.L. Pokotilo (1926) and V.R. Braitsev (1928). Thereafter (1950–1960), various aspects of the problem of the surgery of the esophagus (surgical treatment of esophageal cancer and cardia, post-ambustial cicatricial strictures, cardiospasm) were developed in Moscow by students of Professor V.R. Braitsev – Professor A.S. Kan-Kogan and T.P. Makarenko, and in Krasnoyarsk Professor A.M. Dykhno – a student of Professor N.I. Napalkov, a prominent representative of the scientific school of P.I. Dyakonov – addressed the same problem. On this basis, we can speak of the development and continuation of the fruitful work of P.I. Dyakonov’s scientific school of the surgery of the esophagus between the middle and the second half of the 20th century.

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