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Easy to say, hard to do[1].

To the anniversary of two fundamental discoveries. Part 1

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Abstract

On the eve of the anniversaries of two historical events: the 145th anniversary of the experiments in which Eck's fistula was performed and the 55th anniversary of the successful clinical approbation of the selective distal splenorenal anastomosis, a retrospective analysis of the key historical stages in the development of portal hypertension surgery from the first attempts to describe the anatomy of the hepatic vascular system, explaining its purpose in the body, the development of direct portocaval anastomosis, the widespread use of selective splenorenal anastomoses, to the transjugular intrahepatic portosystemic shunt procedure and orthotopic liver transplantation. At the same time, the emphasis is focused on the most prominent researchers and clinicians who passed this path. The expediency of an integrated approach in solving the problems of portal hypertension with the development of both fundamental and applied clinical and organizational aspects is substantiated. It is shown that the discoveries born from the generalization of the results achieved

[1] From Lat. − Facĭle dictu, difficĭle factu

by numerous researchers have contributed to a better understanding of this field of medicine, have become a solid foundation for what we have today and are a reliable platform for a successful start into the future.

Keywords: history of medicine, portal hypertension, surgical treatment

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Introduction

“There are times when, in order to highlight and understand the present, it is useful to turn over several forgotten pages in the history of medicine, and perhaps unknown for many rather than so much forgotten”

N.N. Burdenko

September 2022 is marked by two historical events that have had a huge impact on the development of surgery for portal hypertension that is a hemodynamic anomaly in the form of a chronic rise of pressure in the vessels of the portal venous system, leading to potentially life-threatening complications. The mere mention of portal bleeding from the esophagus or stomach varices evokes absolutely opposite emotions in doctors who have faced them on their professional path: from a heady premonition of the opportunity to effectively apply their knowledge and clinical experience to a sticky fear of fatal hopelessness and futility in their attempts saving the patient's life. And so, 145 years ago, a young Russian doctor Nikolai Vladimirovich Eck at the St. Petersburg Imperial Medical and Surgical Academy for the first time in an experiment, after crossing the portal vein, connected its distal end to the inferior vena cava. Eck's

fistula, which today we would call a total porto-caval shunt, with which help "blood from the portal vein could be directed right into the general circulation without any danger to the body" immortalized the name of the author, enabling hepatology surgeons to walk confidently along the tortuous historical way of portal hypertension surgery. Fifty-five years ago, 90 years after N.V. Eck, W. Dean Warren, Robert Zeppa et John J. Fomon at the University of Miami School of Medicine − Jackson Memorial Hospital (Miami, Florida, USA) proposed a new at that time selective bypass operation through the spleen in situ, marking the beginning of an era of effective surgical treatment of patients with portal hypertension using a selective distal splenorenal shunt, which allowed surgeons to preserve the spleen and left kidney, and also provided a decrease in pressure and volume of flow through the gastroesophageal veins, the maintenance of liver portal venous perfusion and constant venous hypertension in the intestinal vascular bed with postoperative prevention of post- shunt encephalopathy and acute liver failure.

In anticipation of the approaching anniversaries of these two historical events, we took the liberty of reminding ourselves of the long and thorny path of portal hypertension surgery. The dramatic history of portal hypertension surgery from the first attempts to describe the anatomy of the vascular system of the liver, explain its purpose in the body, the development of a direct porto-caval fistula, the widespread use of selective splenorenal anastomoses, to the transjugular intrahepatic portosystemic shunt procedure and orthotopic liver transplantation is full of bright events, impressions and emotions of deep respect for those researchers and clinicians who have worked in this field. In this review, we will highlight only the key historical steps, with an emphasis on some of the characters who went through this path. Fundamental discoveries in portal hypertension surgery born from the generalization of the results

achieved by each of them individually, certainly, contribute to a better understanding of this area of medicine, become a solid foundation for what we have today and are a reliable platform for a successful start into the future.

Part I. Start

Vita brevis, ars vero longa, occasion autem praeceps, experiential fallax, judicium difficile - Life is short, the path of art is long, the case, on the contrary, is fleeting, experience is deceptive, judgment is difficult.

Hippocrates, Liber I. Hippocrates, Book I

The Greeks have a myth about how Prometheus, whose name means "Prophet", was punished by Zeus for stealing fire from the Gods and passing it on to people, thereby preventing the extinction of the human race planned by the Gods of Olympus. The Gods took revenge, and Prometheus was chained to the mountain. “Every day a huge eagle flies, rustling with mighty wings, onto a rock. He sits on the chest of Prometheus and torments it with claws as sharp as steel. The eagle tears the liver of a titan with its beak. Blood flows in streams and stains the rock; blood freezes in black clots at the foot of the cliff; it decomposes in the sun and infects the air around with an unbearable stench. Every morning an eagle flies in and starts its bloody meal. During the night, wounds heal, and the liver grows again to provide new food for the eagle during the day. Years, centuries, these torments last. The mighty titan Prometheus was exhausted, but his proud spirit was not broken by suffering” (Fig. 1). The first mention of the myth of Prometheus is found in the tragedy of one of the most famous tragedians of the past Aeschylus (525 BC - about 455 BC) "Bound Prometheus" [1]. Be that as it may, but this legend confirms that already in the 5th century BC, people attached particular importance to the function of the liver.

Fig. 1. Torture of Prometheus. Painting (oil on canvas) by Salvator Rosa (executed c. 1646-1648) [Galleria Nazionale d'Arte Antica in Palazzo Corsini, Rome, Italy]

During the time of Hippocrates (*about* 460−370 BC), Greek religion and philosophy did not allow the opening of the body of a deceased person (Fig. 2). That is why, although Greek medicine tried to be based more on evidence than on theology, it knew almost nothing about human anatomy and physiology. At the same time, Hippocrates established a link between jaundice and "hard liver" [2].

Fig. 2. Hippocrates examines the patient's upper abdomen [photo by Barbara Bain, St Mary's Hospital, London from Wikins B.S. The spleen. *British Journal of Haematology.* 2002;117:265–274. Available at: https://doi.org/10.1046/j.1365-2141.2002.03425.x]

On the other hand, in Alexandria (Egypt), human autopsy was allowed. It was in Alexandria, in the 4th century BC, that the Greek physician Herophilos (335−280 BC) (Fig. 3) was one of the first to describe the vessels of the liver and tried to explain the significance of the portal venous system in the human body: “…nature has created special veins that are designed to feed the intestines, and they do not go to the liver; these veins end in the glandular bodies, while all the other veins return to the hilus...” [3, 4].

Fig. 3. Herophilos (Greek: Ἡρόφιλος) (335–280 BC). As Hippocrates is called the Father of Medicine, so Herophilus is called the Father of Anatomy. Available at: https://anatomy.fandom.com/ru/wiki/Герофил

In 1315, an Italian physician, anatomist and professor of surgery Mondino de Liuzzi (Mundinus) (about 1270−1326) (Fig. 4), who lived and worked in Bologna, performed the first "public" autopsy of a deceased person. In 1319 he published the first medieval textbook, Anhotomia, designed "in accordance with reality". In it, he first described the anatomy of the vascular system of the liver. This book was accepted by all medical faculties in Europe and remained the only authority in its

field for about 200 years, until the time of the Flemish anatomist Andreas Vesalius (1514−1564) [5].

Fig. 4. Mondino de Liuzzi (Mundinus) (c. 1270–1326).
Available at: https://www.researchgate.net/figure/Portrait-of-Mondino-created-by-Giovanni-Alessandro-Brambilla-Available-from_fig1_260431145

The great Italian artist, architect, sculptor and scientist, inventor of the Renaissance Leonardo di ser Piero Da Vinci (Fig. 5), having a special permit, which was issued in Florence to students who received the degree of "an Artist", at the age of 20, he began to conduct anatomical autopsies of the dead people bodies.

Fig. 5. Leonardo di ser Piero da Vinci (1452-1519). Turin self-portrait (after 1515). [Royal Library, Turin, Italy]

As a result, in 1506, he was the first to perform an anatomical description of a case of cirrhosis of the liver with portal hypertension: “... the artery and vein that runs from the spleen to the liver become so large that they block the blood coming from the mesenteric vein; the last vein expands so much and becomes so tortuous like a snake that the liver dries up and becomes like frozen bran, both in color and in consistency ... ”However, the changes found in the liver were mistakenly associated with reduced perfusion, as a cause of portal hypertension (Fig. 6) [4, 6].

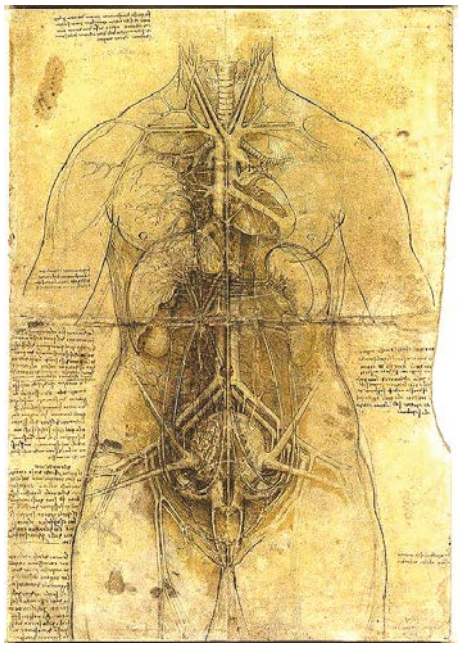

Fig. 6. Drawing of the arterial and venous circulation in the liver by Leonardo da Vinci (c. 1512). [Royal Collection, Windsor Castle, London, UK]

In 1543, the Flemish anatomist, Andries van Wesel (lat. Andreas Vesalius) (1514–1564), Professor at the University of Padua (Fig. 7), published the book “De humani corporis fabrica”, in which he first accurately described the portal vein system (Fig. 8). On the cover of the book there was an illustration of a deceased person public autopsy at the University of Padua. The monkey and dog looking at the autopsy symbolized the origin of many errors in human anatomy and physiology as a result of extrapolation of facts obtained from animals to humans (Fig. 9) [4, 7].

Fig. 7. Andreas Vesalius (Dutch: Andries van Wesel, Latin: Andreas Vesalius) (1514–1564). Available at: https://www.gla.ac.uk/myglasgow/library/files/special/exhibns/month/june2007.html

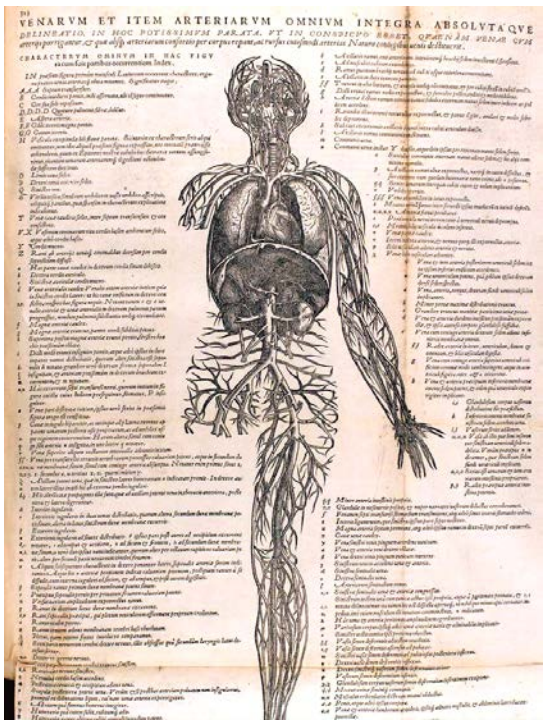

Fig. 8. Illustration from the book “De Humani Corporis Fabrica”. Available at: https://www.pinterest.ru/pin/19210735888125564/

Fig. 9. Cover of the book “De Humani Corporis Fabrica”. Available at: https://www.gla.ac.uk/myglasgow/library/files/special/exhibns/month/june2007.html

Significant progress in understanding the essence of portal hypertension could be achieved after publication of Exercitatio anatomica de motu cordis et sanguinis in animalibus” by William Harvey (1578–1657) in 1628 (Fig. 10) [8]. In it, he first formulated his theory of blood circulation and provided experimental evidence in favor of the fact that, contrary to Galen's statements about the flow of blood from the organs that produce it to the heart, blood returns to the heart in a closed cycle. This created the scientific basis for further research.

Fig. 10. William Harvey (1578–1657). Available at: http://canadiancommonsense.blogspot.com/2018/09/the-greatest-people-of-17th-century.html

In 1650 in London, the British physician Francis Glisson (1597−1677) (Fig. 11), using a goat as an experimental model of research, for the first time demonstrated the details of blood circulation in the portal vein system. Milk injected into the portal vein first entered the liver, then into the inferior vena cava, and then into the right half of the heart [9, 10].

Fig. 11. Francis Glisson (1597–1677). Available at: https://en.wikipedia.org/wiki/File:Francis_Glisson.jpg

In 1665, in the book "De Hepate" Marcello Malpighi (1628–1694), Professor of the University of Bologna (Fig. 12) was the first to describe in detail the microscopic anatomy of the liver [9, 11].

Fig. 12. Marcello Malpighi (1628–1694). Available at: https://wiki2.org/en/File:SA_178-Marcello_Malpighi_(1628-1694)_jpg

Gross pathological manifestations of liver cirrhosis were well described at the end of the 17th century by John Brown (1642–1702), an Appointed Surgeon of Charles II at St. Thomas Hospital in Southwark. On December 1, 1685, he reported to the Royal Society on "the liver of a hydropical Person: “... Paracentesis ... was done by me on November 14, 1685 ... the next morning he died ... At the autopsy ... I extracted about 24 liters of water; he had a strong inflammation of the peritoneum ... the liver, which I will now describe to you ... Its size was not extraordinary, but rather seemed smaller than usual ... It consisted of concave, convex and internal parts of the glands, which (together with the vessels) made up all of it substance ... These glands contained yellowish ichor, similar to many abscesses, and, I believe, this was part of the bile ”(Fig. 13) [12].

Fig. 13. John Brown (1642–1702). Available at:
https://en.wikipedia.org/wiki/John_Browne_(anatomist)

In 1761, an Italian anatomist Giovanni Battista Morgagni (1682−1771), Professor of Padua University (Fig. 14), published the textbook “De sedibus et causes morborum per anatomen indagates” (Fig. 15). In it, based on his own experience and the experience of his mentor

at the University of Bologna, Professor Valsalva, he described the features of the liver cirrhosis according to the results of the autopsy of a human who died from gastrointestinal bleeding: "... The short gastric veins and the splenic vein were dilated and tortuous, and the liver had serious changes: it was hard and yellow" [9, 11].

Fig. 14. Giovanni Battista Morgagni (1682–1771). Available at: https://commons.wikimedia.org/wiki/File:Giovanni_Battista_Morgagni_(1682_-_1771),_Italian_anatomist_Wellcome_V0004119.jpg

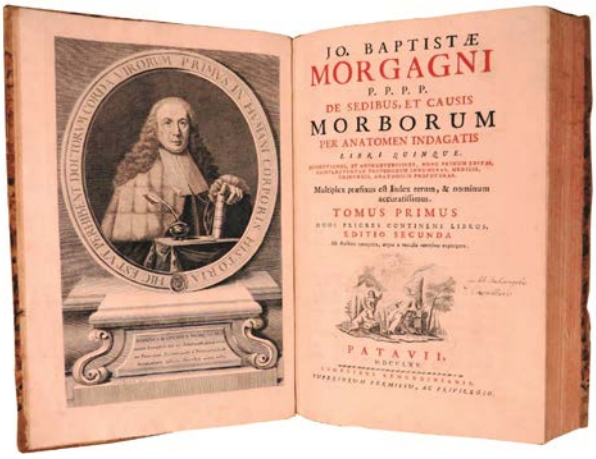

Fig. 15. The book "De sedibus et causes morborum per anatomen indagates". Available at: https://www.iberlibro.com/primera-edicion/sedibus-causis-morborum-anatomen-indagatis-libri/14184252635/bd

In 1826, a French physician Rene Theophile Hyacinthe Laënnec (1781−1826) (Fig. 16) published a classic description of cirrhosis: “... the liver, reduced to a third of its usual size ... its outer surface slightly laminated and wrinkled, had a grayish-yellowish tint; cut all over, it seemed to consist entirely of many small grains, round or ovoid in shape, the size of which varied from millet grain to hemp. These grains, easily separable one from the other, did not show between them a place in which any remnants of the liver tissue itself could still be discerned ... This type of growth belongs to the group of those that are confused under the name of scirrhus. I think we should call it cirrhosis of the liver because of its color [gr. kirrhosis, orange color]. Its development in the liver is one of the most common causes of ascites" [13].

Fig. 16. Rene Theophile Hyacinthe Laënnec (1781–1826). Available at: https://ru.wikipedia.org/wiki/Лаэннек,_Рене

During the 19th century, it became increasingly clear that the clinical presentation of splenomegaly, ascites, and gastrointestinal bleeding was generally due to obstruction of blood flow in the portal system. The cases were described by F.A.B. Puckelt in Royal College of

Physicians of Edinburgh [14] in 1818, and by J. Cruveilhier [15] in 1832, whose name is associated with the Cruveilhir-Baumgarten syndrome, that is, venous connections between the blood supply areas of the umbilical and portal veins that develop as a result of increased pressure in the portal vein in liver cirrhosis. In 1841, A. Raciborski pointed out that collaterals can form between the portal and caval systems through short gastric veins, hemorrhoidal veins, and veins in the abdominal wall [16]. Later, in 1859, P.C. Sappey added esophageal varices as another pathway for collateral blood flow [17]. In 1856, M. Ore [18] found that patients who die from cirrhosis often develop portal vein thrombosis [18]. In 1877, M. Dusaussey suggested that the obstruction of portal blood flow is a consequence of cirrhosis of the liver [19].

In May 1877, a young doctor from Philadelphia (Pennsylvania, USA), B.F. Lautenbach, who worked at Moritz Schiff physiological laboratory in Geneva (Switzerland) found that portal vein occlusion was fatal in dogs, cats, and rabbits. In his opinion, this was due to the fact that harmful substances in the portal blood could not get to the liver for detoxification [20].

The first documented publication of a portosystemic shunt was an animal study by the brilliant young Russian surgeon Nikolai Vladimirovich Eck (1849−1908) (Fig. 17) in September, 1877. Eck was 28 years old when working in the laboratory of Professor Ivan Romanovich Tarkhanov at the Imperial Medical and Surgical Academy in St. Petersburg (Russia), he successfully performed a direct anastomosis of the portal vein with the inferior vena cava in an experiment on dogs in order to "clarify some physiological problems", namely the idea expressed by B. F. Lautenbach that the redirection of portal blood into the systemic circulation is dangerous for the body [21].

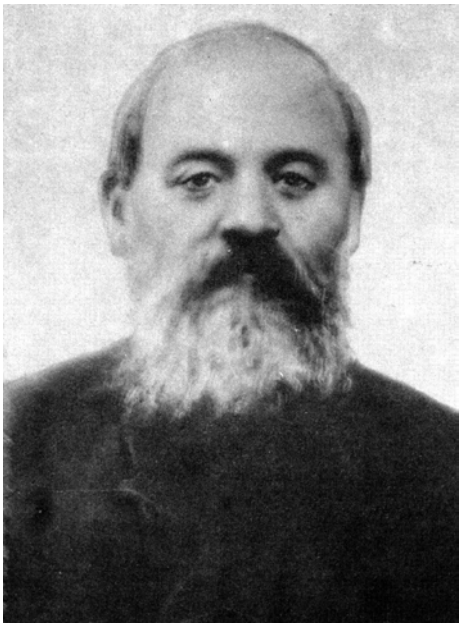

Fig. 17. Nikolai Vladimirovich Eck (1849-1908). Available at: https://www.geni.com/people/Николай-Экк/6000000030529918460

N.V. Eck published the data on 8 operations, described in detail the technique of performing porto-caval anastomoses, which he made according to the "side-to-side" mode, 1.5 cm long, and ligated the portal vein above the anastomosis (Fig. 18).

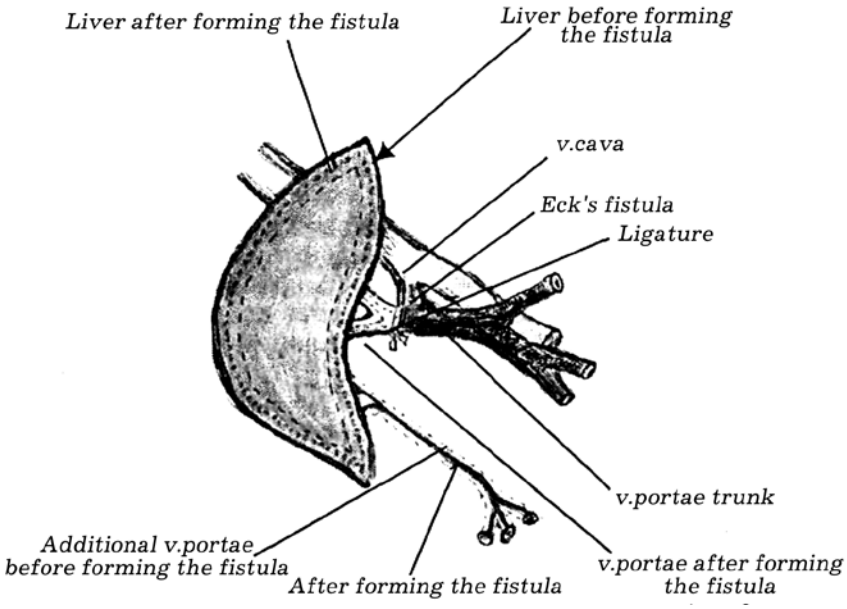

Fig. 18. Scheme of Eck's surgery. Available at: http://anfiz.ru/books/item/f00/s00/z0000016/st179.shtml

Seven of the eight dogs published in the report survived between 2 and 8 days, dying from peritonitis and intestinal strangulation. Thus, the perioperative mortality rate for 1 week was 87.5%. At the same time, during autopsy, shunt patency was established in 6 of 7 dead animals. The eighth dog survived and escaped 2.5 months after surgery, which precluded an autopsy to assess the graft patency. After participation in the Russian-Turkish 1877–1878 war as a Surgeon of the Divisional Infirmary and Field Dressing Station, N.V. Eck went into private practice; and in the period from 1889 to 1890, according to his daughter Zinaida Nikolaevna Eck, he successfully performed Eck's fistula operation on a woman with portal hypertension syndrome and ascites. The patient recovered after the operation, but her further fate is unknown. No reports of this clinical case were found in the literature, because the author never published its results [22, 23].

In 1902, a French physician, Augustin Nicholas Gilbert (1858−1927), Professor of Medicine in Paris (Fig. 19), first coined the term "portal hypertension". He described the properties of collateral circulation from the portal venous basin to the caval one, put forward the hypothesis that cirrhosis causes hypertension in the portal venous system. This, in turn, leads to the formation of various kinds of collaterals between the portal and vena cava. Thus, portal venous hypertension is responsible for the expansion and rupture of the esophageal veins [4, 24].

Fig. 19. Augustin Nicolas Gilbert (1858–1927). Available at: https://www.biusante.parisdescartes.fr/histoire/images/?do=informations-iconographiques&refphot=anmpx47x0008b

N.V. Eck could not fully appreciate the long-term results of the operation he proposed, since the only dog that had recovered from him escaped from the laboratory, and he himself was forced to stop the experiments in connection with the departure to the army. The solution to this problem was undertaken by the great Russian physiologist Ivan Petrovich Pavlov (1849–1936) (Fig. 20).

Fig. 20. Ivan Petrovich Pavlov (1849-1936). Available at: https://ru.wikipedia.org/wiki/Павлов,_Иван_Петрович

I.P. Pavlov was sufficiently impressed with Eck's portocaval fistula, which he considered "important and worthy of interest". He called N.V. Eck a "brave surgeon" and did not criticize the latter's overly enthusiastic interpretation of the results of his experiments [22]. Working at the Institute of Experimental Medicine, I.P. Pavlov improved the technique of the operation by ligating the inferior vena cava above the shunt instead of the portal vein (Fig. 21). He then carefully studied its pathophysiology, including the contribution of the development of postoperative hepatopetal collaterals to the survival of experimental animals [25]. On a huge material, I.P. Pavlov proved the vitality of N.V. Eck's operation. That is why it was rightly called the Eck-Pavlov fistula. Exhaustive and careful experiments have shown that the complete redirection of the portal flow through Eck's fistula after 6-8 weeks leads to "meat intoxication". This was undoubtedly the first scientific description of what we today call hepatic or portosystemic encephalopathy [26].

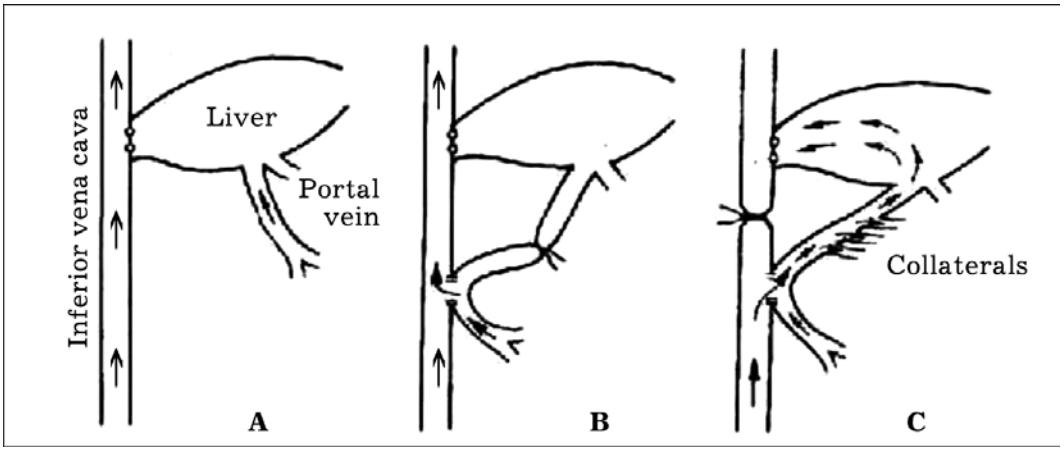

Fig. 21. Schematic representation of the Eck's and Eck-Pavlov's fistulas (according to K.M. Bykov): A – location of the vessels before surgery; B – Eck's fistula; C – Eck–Pavlov's fistula.

In 1887, the Dutch physician and pathologist S. Talma proposed suturing the greater omentum to the liver (omenthohepatopexy), hoping that if adhesions occur between the greater omentum and the liver, a vascular network develops, as a result of which the liver will receive additional arterial blood, and the outflow of venous blood from it will improve. The technique of the operation consisted in applying a slight injury to the serous membrane of the liver with a special metal brush until drops of blood appeared. Then a part of the greater omentum was fixed to the liver and its ligaments with several interrupted sutures. In 1889, omentohepatopexy was first performed by S. Talma in a patient with liver cirrhosis with ascites [27]. Regardless of S.Talma, the idea of such an operation was proposed in 1895 by an English surgeon D. Drummond, and in 1896, the operation was performed in clinical conditions by R. Morison [28]. It was named Talma – Drummond – Morison operation.

Subsequently, a large number of options were proposed, a surgical increase in the number of natural intra-abdominal portosystemic collaterals performed in the hope of reducing pressure in the portal venous system: transposition of the spleen into the chest cavity [29, 30],

suturing of the spleen to the lungs [31], attachment of a segment of the ileum with vessels on the inner side of the chest wall [32], the use of the free end of the dissected rectus abdominis muscle to evacuate ascites from the abdominal cavity [33]. Unfortunately, all of them did not improve the results and, in the end, were abandoned.

In 1894 the Italian physician Guido Banti (1852−1925) (Fig. 22) in an attempt to reduce pressure in esophageal varices suggested that this could be achieved by splenectomy [34].

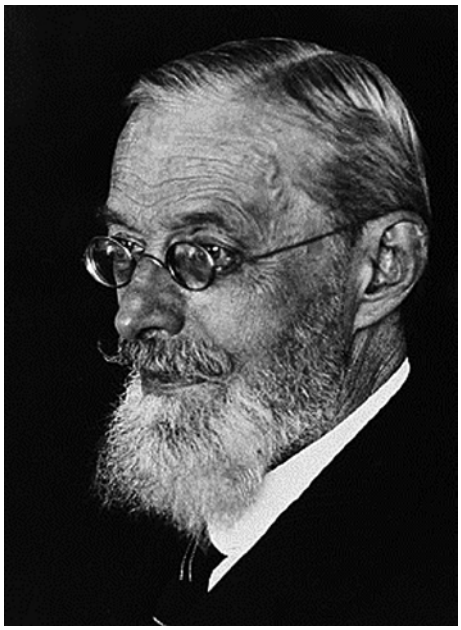

Fig. 22. Guido Banti (1852–1925). Available at: https://wellcomecollection.org/works?query="Banti%2C%20Guido%2C%201852-1925."

Unfortunately, the expectation of reducing the portal pressure by reducing the venous inflow from the removed spleen, redistributing arterial circulation in the celiac trunk basin, and, finally, reducing hypersplenism, which aggravated the already hard condition of patients with cirrhosis, did not materialize. Splenectomy in such a problematic category of patients was accompanied by high postoperative mortality due to blood loss, progression of liver failure and hepatorenal syndrome,

portal vein thrombosis. Varicose bleeding in patients after splenectomy in most cases ended fatally. Postoperative mortality after splenectomy was 43%, and early recurrence of variceal bleeding was noted in 36% of patients [35]. In addition, splenectomy, which became quite common in the middle of the 20th century, often aggravated the already deplorable condition of patients, causing a number of serious complications, including asplenic hemorrhagic thrombocythemia, which was subjected to correction with great difficulty [36].

It took a long 26 years before the "Eck's fistula" was used in clinic. The first tentative steps along this path were taken at the beginning of the last century. In 1903 in Perigueux (Southern France) M.E. Vidal performed the first known successful portosystemic shunt in humans [37]. Initially, he planned to perform the Talma operation on a patient with ascites, i.e. suturing the omentum to the parietal peritoneum. However, during the operation, it was found that the greater omentum is a compacted mass, which did not technically allow omentopexy. Instead M.E. Vidal was forced to perform, fortunately successfully, the operation described in 1902 by Iginio Tansini from Pavia (Italy) [37]. This was the earliest documented direct porto-caval shunt in humans that temporarily resolved ascites. Two weeks later, "meat intoxication" developed, which M.E. Vidal treated with sweetened milk enemas. However, the patient developed sepsis, progressive liver failure, and after 3.5 months he died from an acute generalized infection of an enterogenic nature, as the author termed. M.E. Vidal did not recommend this operation, arguing that it turns off the liver, which is a filter, from the portal circulation, and this allows the “hordes of microbes” from the intestine to enter into the systemic circulation, inevitably causing sepsis [37]. The description of this case found a response in a number of surgical manuals of that time,

the authors of which also did not recommend this intervention for clinical use.

In 1910, the French surgeon M.F. de Martel reported a side-to-side anastomosis of the superior mesenteric and inferior vena cava. The patient died of anuria. Almost at the same time, Lyon surgeons E. Villard, L. Tavernier published a description of another clinical example. In 1910, they performed an operation, in which the proximal end of the superior mesenteric vein was sutured end-to-end with the proximal section of the transected right ovarian vein. This patient did not survive either. At autopsy, the anastomosis was found to be thrombosed [38]. In 1911, P. Rosenstein performed Eck's fistula operation for liver cirrhosis and ascites in a 60-year-old woman. At 5 months postoperatively, this patient required only paracentesis with much less ascites [39]. In 1913, Nikolai Alekseevich Bogoraz (1874–1952) (Fig. 23), being a Professor at the University of Warsaw, published a case report about the world's first successful clinical application of mesenteric-caval anastomosis in a patient with cirrhotic ascites [40].

Fig. 23. Nikolai Alekseevich Bogoraz (1874-1952). Available at: http://museum.rostgmu.ru/персоналии/заслуженные-деятели-науки/богораз-николай-алексеевич

Unfortunately, at that time the technique of applying a vascular suture had not yet been worked out, there were no suture material and surgical instruments adequate to the needs, and the anesthetic manual did not meet the surgical task. These objective circumstances, which did not allow to impose a vascular anastomosis without the risk of harm to the patient, led to the actual rejection of portosystemic shunts for the next 40 years [38].

Conclusion

On such a pessimistic note, the empirical, anatomical, and morphological period in the history of the portal hypertension surgery development ended. By the end of it, surgeons, based on their brilliant knowledge of human anatomy, had achieved serious success, primarily in the technique of episodically performed surgical interventions. However,

the improvement of surgical techniques was not accompanied by significant progress in the results of treatment, because, according to the apt definition of N.I. Pirogov "... a favorable outcome of the operation depended both on the skill of the surgeon, and also on happiness." But, despite this, more and more often ahead of the surgeon's scalpel was the desire to develop medical science based on the study of the essence of the pathological process. More and more often, surgeons dealing with portal hypertension could afford to use the surgical method, not only as a last chance to save the patient, but also as an alternative method of treatment that did not directly threaten the patient's life. And through the dense veil of various clinical manifestations of the rise in pressure in the vessels of the portal venous system, often of a life-threatening nature, the features of the steadily approaching brilliant technological age of portal hypertension surgery became more and more clearly visible...

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