FRIEDRICH-CHRISTIAN ROSENTHAL: SURGEON AND ANATOMIST

FRIEDRICH-CHRISTIAN ROSENTHAL was a prominent German anatomist and surgeon. He was born on June 3, 1780 in Greifswald, Germany, on the Baltic coast. He was the youngest of the five children of Johann-Christian Rosenthal. Johann-Christian was originally from Halberstadt, a small city in the Harz mountains, and was a shopkeeper (spice merchant). The family was a case study of misfortune wreaked by infectious disease. In 1806, Friedrich-Christian’s eldest brother died of tuberculosis at 36 years of age; his father died of typhus in 1807; his mother died of tuberculosis in 1808; he would die of tuberculosis in 1829; and his second brother, who had taken over their father’s shop, also ultimately died of tuberculosis in 1846.

Friedrich-Christian Rosenthal was born on June 3, 1780 in Greifswald, Germany, on the Baltic coast. He was the youngest of the five children of Johann-Christian Rosenthal. Johann-Christian was originally from Halberstadt, a small city in the Harz mountains, and was a shopkeeper (spice merchant). The family was a case study of misfortune wreaked by infectious disease. In 1806, Friedrich-Christian’s eldest brother died of tuberculosis at 36 years of age; his father died of typhus in 1807; his mother died of tuberculosis in 1808; he would die of tuberculosis in 1829; and his second brother, who had taken over their father’s shop, also ultimately died of tuberculosis in 1846.

Friedrich-Christian Rosenthal entered the University of Greifswald in 1797 where he came under the tutelage of Karl Asmund Rudolphi (1771–1832) (Fig. 4). Rudolphi was an anatomist and zoologist who became known for his work on the comparative anatomy of helminths (worms), although his thesis was on “On the cerebral ventricles” (3) (the German Society for Parasitology awards a Karl-Asmund-Rudolphi medal annually). A durable friendship sprang up between Rudolphi and Rosenthal.

Rosenthal moved to Jena in 1801 and completed his dissertation, entitled De organo olfactus quorundam animalium (or, “Of the olfactory organ of certain animals”), on November 29, 1802 at the University of Jena. Dedicated to Rudolphi, it was a treatise on the comparative anatomy of the olfactory system. Subsequently, he entered surgical training in Würzburg where he was taught surgical anatomy by Franz Caspar Hesselbach (1759–1816), Professor of Surgery in Würzburg, who was well known for his work on the surgical anatomy of inguinal hernia (14) (Hesselbach’s triangle, or the inguinal triangle, is the area in the lower abdominal wall bounded by the inguinal ligament inferiorly, the rectus abdominis medially, and the inferior epigastric vessels laterally. Separate Hesselbach eponyms include Hesselbach’s fascia, Hesselbach’s hernia, and Hesselbach’s ligament.).

After a mere 6 months in Würzburg, Rosenthal moved on to Vienna, where he studied obstetrics and ophthalmology and came under the influence of Johann Peter Frank (1745–1821). Frank was a father of social hygiene and public health services in Germany. With his masterwork, System einer Vollständigen Medicinischen Polizey (or, “System of a Complete Medical Policy”), published in nine volumes between 1779 and 1827, he established public health as a scientific discipline. To this day, the Johann-Peter-Frank Medal is given every year in Germany to honor public health achievement. Among many things, Frank added the term mellitus (“honey-sweet”) to distinguish diabetes mellitus from
diabetes insipidus and introduced a yeast fermentation test for the quantitative determination of urinary glucose, forever thereafter relieving physicians of the need to taste patients’ urine.

In 1804, Rosenthal returned to Greifswald to start private practice. During the next few years, again under the influence of Rudolphi, he continued his olfactory anatomic studies and proceeded to complete his habilitation in 1807 with the publication of the article, “Anatomical Inquiry on the Olfactory Organs of Certain Animals,” a title remarkably similar to his previous thesis!

In 1809, the University of Berlin was founded under the authority of Friedrich Wilhelm III (1770–1840), King of Prussia (Fig. 5). Rudophi was invited there by Johann-Christian Reil (1759–1813) (Fig. 6), renowned physician, anatomist, and physiologist, and founder of German psychiatry. Soon after, in 1810, Rosenthal was persuaded to give up his practice for an appointment at the University of Berlin (5).

At Berlin, Rosenthal started construction of the detailed ichthyotomic plates (Ichthyotomische Tafeln) that would distinguish him (2). In 1813, he aided in the revolt against Napoleonic oppression by serving as an army medical officer (Napoleon’s army had occupied Prussia and Lower Pomerania by 1810). After this interlude, Rosenthal returned to Berlin and to his anatomic studies. In addition, together with Rudolphi, he taught an anatomy course to medical students in Berlin. However, according to one of their students, Karl Ernst von Baer, “They were mainly busy with their own work in a separate room and joined the prosecting students occasionally, only. They answered questions, but tried to get back to their own work as soon as possible. They never gave practical demonstrations” (5, p 720).


**FIGURE 2. Map of northeastern Germany/Baltic coast region. Blue arrow denotes Greifswald (Greifswalde). Greifswald lies on the Baltic Sea due north of Berlin in the modern German state of Mecklenburg-Lower Pomerania (part of the former East Germany). This map is from a website organized by several of Rosenthal’s descendants interested in genealogy.**

**FIGURE 3. Partial Rosenthal family tree. Friedrich-Christian is highlighted in red. This family tree was drawn by Rosenthal descendants who emigrated to the United States.**

**ROSENTHAL AS NEUROANATOMIST**

In 1819, Rosenthal left Berlin to return to Greifswald and was made Professor of Physiology and Anatomy the following year. In the 1820s, the main focus of his work turned to cranial anatomy. In neuroanatomy, he was motivated by his association with Reil, his master in this respect (5). In Greifswald, he delivered his first lecture “On vessels and nerves” in 1822. In 1823, he published Über den Bau der Spindel im menschlichen Ohr (or, “On the construction of the spindle in the human ear”). In it, he corrects Scarpa, carefully stating that Scarpa’s representation “does not completely agree with nature” (12, 15). He goes on to describe a spiral canal (“Kanal”) in the modiolus of
the cochlea (canalis spiralis modiiolii):

“Nerve fibers that penetrate through the perforations [of the tractus spiralis foraminulentus] reach this canal and then distribute themselves as thin fibers on the spiral plate. Fibers destined for the first turn ascend close to the inner tubular lamella. Those for the second turn are guided through this canal to the tubular substance of the associated spiral lamella” (8, p 76, 12).

Moralee (8) notes that Samuel Thomas Soemmering may have described this canal as early as 1806. Schacht and Hawkins (15) and Moralee (8) clear up historical confusion that other authors had created by suggesting that another Rosenthal (Isidore Rosenthal, a German physician, 1836–1915) may have been associated with this discovery. We know Rosenthal’s canal today as the spiral canal of the modiolus, which follows the course of the bony spiral lamina of the cochlea and contains the spiral ganglion of the cochlear division of the vestibulocochlear nerve. The human spiral ganglion has only recently been beautifully demonstrated by excellent fixation (Fig. 7) and scanning electron microscopy (6).

It was in 1824 that Rosenthal published De intimis cerebri venis seu de venae magnae Galeni ramis (or, “On the deep cerebral veins or the branches of the great vein of Galen”), which forever after has connected his name to the basal cerebral vein (Fig. 8) (13). In this Latin treatise, Rosenthal described what he called the vena ascendens seu basilaris (ascending or basilar vein), as well as other deep veins (Fig. 9). Who was the first to name the vein after Rosenthal? As Helmut Ferner (4) noted in 1958, it went by several names: Fedor Krause called it the vena cerebralis inferior and Henle called it the vena cerebri anterior; in his exhaustive anatomic and angiographic study in 1954, Curt Johanson (7) simply called it “the basal vein.” It was the Hungarian-born Austrian anatomist Joseph Hyrtl (1810–1894), who clearly defined the Vena basilaris Rosenthalli (Hyrtl also described the meningolacrimal foramen [canal of Hyrtl] in his
immense *Lehrbuch der Anatomie des Menschen*, or, “Textbook of human anatomy.” This textbook was quite influential; it went through some 20 editions and was translated into several languages. We now know that the basal vein of Rosenthal forms in the anterior perforated substance, courses between the midbrain and temporal lobe, and passes posterosuperiorly through the ambient cistern to join the quadrigeminal cistern to form the vein of Galen. In doing so, it drains the anterior and medial temporal lobe and walls of the crural and ambient cisterns (9, 11). Today, excellent noninvasive visualization of the vein of Rosenthal is possible via magnetic resonance imaging (1) or computed tomographic (16) venography.

**PERSPECTIVE**

Rosenthal was, first and foremost, a general anatomist. The *General German Biography* emphasized his renown for anatomic studies on whales, seals, and jellyfish (10). (One of the most comprehensive biographical reference works in the German language, the *Allgemeine Deutsche Biographie* was published in 56 volumes between 1875 and 1912, and contains biographies of approximately 26,500 people who died before 1900 and lived in German-speaking areas. It is now searchable online at http://mdz1.bib-bvb.de/~ndb/adb_index.html). In addition to his *Ichthyotomische Tafeln*, Rosenthal wrote many articles on whale and seal anatomy and neuroanatomy. As late as 1825, Rosenthal was said to have found a whale run aground on a beach and to have preserved it in his Institute of Anatomy.

During the last few years of his life, Rosenthal worked indefatigably to complete a treatise on the anatomy and physiology of the brain and cranial nerves. This took a severe toll on his health. Finally, in the winter of 1829, his health worsened irrevocably and he died of tuberculosis on December 5, 1829. His grand treatise was never published.

**TABLE 1. Chronology of events in the life of Friedrich-Christian Rosenthal**

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1780</td>
<td>Born in Greifswald, Germany</td>
</tr>
<tr>
<td>1797</td>
<td>Entered the University of Greifswald</td>
</tr>
<tr>
<td>1801</td>
<td>Transferred to the University of Jena</td>
</tr>
<tr>
<td>1802</td>
<td>Completed dissertation <em>De organo olfactorius quarundam animalium</em> on the olfactory organ at the University of Jena</td>
</tr>
<tr>
<td>1803</td>
<td>Further medical/surgical training in Würzburg and Vienna</td>
</tr>
<tr>
<td>1804</td>
<td>Returned to Greifswald, started private practice</td>
</tr>
<tr>
<td>1807</td>
<td>Completed habilitation on olfaction: <em>Disquisitio anatomica de organo olfactorius quarundam animalium</em></td>
</tr>
<tr>
<td>1810</td>
<td>Appointed at the newly established University of Berlin</td>
</tr>
<tr>
<td>1812</td>
<td>Began to construct detailed ichthyotomic plates</td>
</tr>
<tr>
<td>1813</td>
<td>Interlude as an Army medical officer in the Province of Neumark</td>
</tr>
<tr>
<td>1820</td>
<td>Made Professor of Physiology and Anatomy at Greifswald</td>
</tr>
<tr>
<td>1823</td>
<td>Described spiral canal of modiolus of the cochlea (“Rosenthal's canal”)</td>
</tr>
<tr>
<td>1824</td>
<td>Described the deep cerebral venous system (including what was later termed the “basal vein of Rosenthal”)</td>
</tr>
<tr>
<td>1829</td>
<td>Died of tuberculosis in Greifswald, leaving unfinished a major treatise on the anatomy of the brain and cranial nerves</td>
</tr>
</tbody>
</table>
The purpose of this report, similar to that of Babin and Haller (2) in 1976, is to deepen understanding and appreciation of the man who gave his name to a canal in the cochlea and the basal cerebral vein (Table 1). By all accounts, Rosenthal was a multifaceted, talented anatomist and an extremely hard worker with a catholicity of interests ranging from whales, seals, and fish to olfaction and cranial anatomy. He never married and lived an itinerant academic lifestyle. His life was marked with misfortune, with his father, mother, and brother dying between 1806 and 1808; and he himself died before completing his masterwork. Nevertheless, his memory lives on not only in the duet of eponyms, but also in genealogical histories passed down by his descendants.

Acknowledgments

We thank Ivo Asmus, reference librarian at the University of Greifswald, for providing access to De intimis cerebri venis (1824); Dr. Klaus Beneke of the University of Kiel for providing his insightful and well-illustrated article on Rudolphi and a copy of Dr. W. Gaude’s important 1956 article on Rosenthal; and Dr. Rudolf Glueckert and Anneliese Schrott-Fischer of the Medical University of Innsbruck for kindly providing their article on human cochlear anatomy and the figure of Rosenthal’s canal. Devin K. Binder is supported by a van Wagenen fellowship from the American Association of Neurological Surgeons.

REFERENCES


COMMENTS

This is a well researched and well written review about a person who is of significant interest to neurosurgeons and radiologists. Friedrich-Christian Rosenthal (1780–1829) should not be confused with W. Rosenthal, who originally described neurofibrillary tangles (“Rosenthal fibers”) in an ependymoma of the spinal cord (1). In the 19th century, there were also other Rosenthals who contributed to the neurological literature, including Moriz Rosenthal (1833–1889) of Vienna and Isidor Rosenthal (1836–1915) of Erlangen. Indeed, W. Rosenthal seems to have been of lesser prominence because I had the most trouble tracking him down.

Samuel H. Greenblatt
Providence, Rhode Island

One of the recommendations for the use of eponyms is that it helps to remind us of the intellectual heritage in our field. In the case of Rosenthal, we see a man dedicated to his field of study who worked indefatigably on his anatomical studies in a wide range of animals. This short biographical report says a lot about the productivity of a dedicated man.

Lycurgus M. Davey
New Haven, Connecticut

I enjoyed this biographical vignette on Friedrich-Christian Rosenthal. There is actually very little written in the English literature on this anatomist, so this piece is a welcome addition. Besides giving an excellent biographical background, including the health tragedies of his family, there is also an excellent review of his two major anatomical contributions: the basal vein of Rosenthal and the spiral canal of the modiolus (Rosenthal’s canal). The discussion of how the eponym for the basal vein of Rosenthal enters the literature is clearly discussed and very much appreciated. The authors have also added some nice illustrations that outline the anatomy of each of these structures. Our readers will find this article a most useful addition to our biographical literature. The collaboration of American and European writers clearly makes this happen.

James T. Goodrich
Bronx, New York

The medical literature is suffused with eponyms. This is particularly true of the nervous system. A recent 383-page book titled Neurological Eponyms makes this point (1). In the book’s preface, the authors explain, “Several criteria were applied to the choice of eponyms to be included. We considered frequency of occurrence, familiarity of the clinical neurologist with the notion or concept and the importance for neurology of the person behind the eponym. Starting at the base (neuroanatomy) and working up to well-defined diseases, we arrived at five classes of neurological eponyms: anatomy and pathology, symptoms and signs, reflexes and tests, clinical syndromes, and, finally, diseases and defects. Of course, there will be
Readers who wonder why certain eponyms were included and others not. Selection is always arbitrary.”

Rosenthal did not merit inclusion in this text, but this is not the issue. Although the eminent anatomist, Joszef Hyrtl, provided the basal vein with the Rosenthal eponym in his influential 1846 tome, this does not justify the decision to publish a biographical article about Rosenthal in the legacy section of *Neurosurgery*. Rosenthal was not a major contributor to the advance of our knowledge of the nervous system. Admittedly, it is difficult to know where to draw the line in determining an individual’s impact on the development of our discipline. Nevertheless, it behooves the editor to be more stringent in his choice of subject matter.

Norman Horwitz
Washington, DC