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Ludwig Rehn (1849–1930): the German surgeon who performed the worldwide first successful cardiac operation

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Summary: Ludwig Rehn, a German surgeon, performed the worldwide first successful cardiac operation in 1896 when he repaired a stab wound to the heart by direct suture. When he presented his work one year later at a surgical conference this pioneering operation evoked considerable ethical discussion. Rehn's surgical contributions also include carrying out the first thyroidectomy in 1880 and clarifying the causes of cancer in workers in the local aniline factories.

Introduction and background

Cardiac operations were rare events in the 19th century and were usually unsuccessful. The Spanish physician Francisco Romero from Catalonia became the first who performed an open pericardiostomy to treat a pericardial effusion in 1801. He presented his work at the Society of the School of Medicine in Paris in 1815 but the procedure was considered too forward and his work was ignored for many years. However, credit should be given to Romero as the first man who directly approached the heart by incising the pericardium¹.

Henry C Dalton (1847–) performed the first suturing of the pericardium on record. The operation occurred on 6 September 1891 in a 22-year-old man who had been stabbed in the chest. Dalton observed a transverse wound of the pericardium about two inches in length and closed the wound by continuous suture. The patient made 'an uninterrupted, rapid recovery'. The published report of the operation appeared in the state medical association's journal and another local periodical in 1894 and in the *Annals of Surgery* the following year.

Daniel Hale Williams (1856–1931) operated in 1893 on James Cornish, a young man with a stab wound to the chest. At surgery he was found to have a pierced blood vessel and a tear to the pericardium. Dr Williams sutured both of these injuries to stop the bleeding. The patient survived the operation and lived another 20 years (Figures 1–3).

The Norwegian Axel Hermansen Cappelen (1858–1919) attempted to ligate a 'bleeding coronary artery'

on 4 September 1895 in Oslo² but the patient died on the third postoperative day.

The German Ludwig Rehn was the worldwide first surgeon to directly suture the myocardium successfully. At the time it was thought that to approach the myocardium directly would cause cardiac arrest but Rehn's operation disproved this and he introduced his cured patient at a surgical meeting in 1897.

Ludwig Rehn's life

Ludwig Rehn was born in the village of Allendorf, Germany on 13 April 1849. His father was a physician and Ludwig the youngest of five children. When he was six years old his parents died and he had to move to Rothenburg where he stayed with a relative. Aged 13 he studied at the convent school in Bad Hersfeld and later recalled³ that he was only interested in German history and literature at school and not in mathematics or Latin. Nonetheless he very much enjoyed his college education. In the autumn of 1869 he entered medical school at the University of Marburg, Germany. His studies were interrupted for two years when he served as a volunteer in the German army during the German–French War (1870–71).

During his medical studies he was influenced by surgeons including Wilhelm Roser and Nathanael Lieberkuehn. He received his doctorate cum laude from the University of Marburg.³ Then he obtained an internship at the hospital in Frankfurt with the help of his brother Heinrich Rehn who worked there as a paediatrician. Later he described this in his memoirs as a very arduous post. After his year of internship he settled in Griesheim near Frankfurt as a general practitioner. There he began his famous studies with the aniline workers and the relationship of aniline and bladder tumours. He was the first to describe in detail the aetiology of aniline-induced cancer of the bladder in detail and this pioneering work had a significant influence in cancer research worldwide.

After moving to Rödelheim, Dr Rehn began performing tracheotomies in patients suffering from diphtheria and hypothesized that that diphtheria caused muscular degeneration, an observation that was accepted only

Orla J Werner, Student, Department of Thoracic, Cardiac and Vascular Surgery, Georg-August-University of Goettingen, Goettingen, Germany. **Christian Sohns**, Cardiologist, Department of Cardiology and Pneumology, Georg-August-University of Goettingen, Goettingen, Germany. **Aron F Popov**, Department of Thoracic, Cardiac and Vascular Surgery, Georg-August-University of Goettingen, Goettingen, Germany. **Jannik Haskamp**, Student, Department of Cardiac, Thoracic, Transplantation and Vascular Surgery, Hannover Medical School, Hannover, Germany. Correspondence: Jan D Schmitto, Cardiothoracic Surgeon, Department of Cardiac, Thoracic, Transplantation and Vascular Surgery, Hannover Medical School, Carl-Neuberg-Str 1, 30625 Hannover, Germany (email: Schmitto.Jan@mh-hannover.de)



Figure 1 Hospital in Frankfurt am Main, Germany, where Dr Ludwig Rehn performed the worldwide first successful heart operation. Figure with kind approval of the Journal *Münchener Medizinische Wochenschrift*

40 years later. He became an acknowledged expert in this area and visited the leading hospitals at the time, in Berlin, Halle and Goettingen. Here he met many important and well-known surgeons including Bernhard

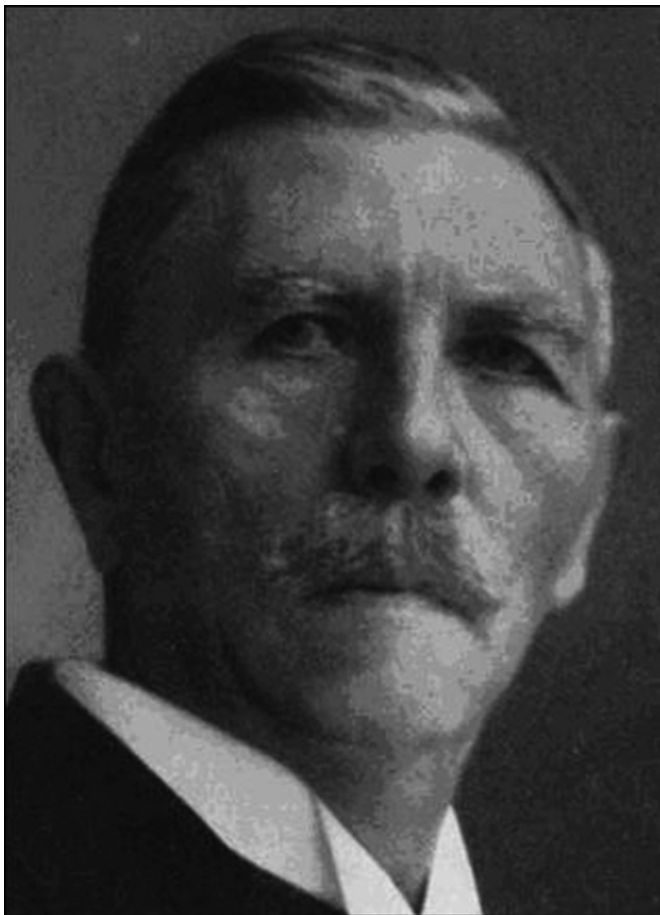


Figure 2 Dr Ludwig Rehn (1849–1930). Figure with kind approval of the Journal *Münchener Medizinische Wochenschrift*

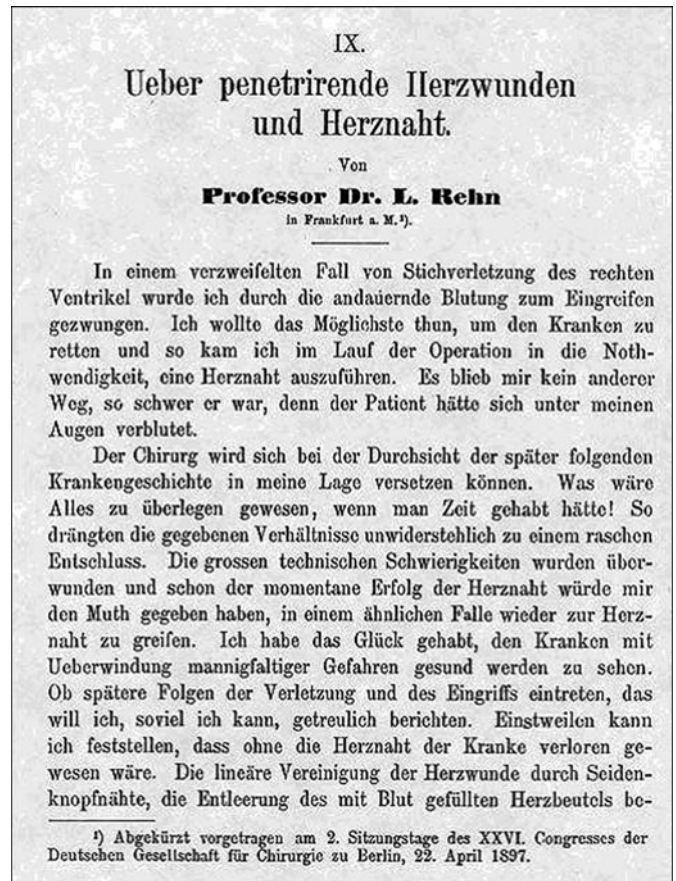


Figure 3 Front page of the report of the first successful cardiac operation performed by Dr Ludwig Rehn in Frankfurt, Germany

von Langenbeck (1810–87) where he received additional 'excellent practical training in operating'³ and Richard von Volkmann (1830–89). He also received an observing fellowship with Rudolf Virchow (1821–1902). Influenced by these famous surgeons, especially von Langenbeck, he decided to stay in surgery. In 1886 he moved back to Frankfurt and studied surgical gynaecology since his friend and colleague Carl Stahl specialized in that area.

In 1884 he published his first paper 'Die Exstirpation des Kropfes bei Morbus Basedow' ('The extirpation of Graves' Disease'). Rehn was displeased with the title as published because he considered the surgical procedure to be a complete thyroidectomy rather than an 'extirpation'. Rehn was not recognized for this work until the neurologist Paul Julius Moebius (1853–1907) referred to Rehn's operative success as influencing the outcome of some of the mental patients he was treating (presumably with thyrotoxicosis). In 1893 at a medical conference in Nürnberg, Germany Rehn stated that 'without thyroid disease there exists no Graves' disease' – a new observation. Even after Rehn published his doctoral thesis in a scientific journal² and also described many of the patients upon whom he had operated, most surgeons at home and abroad ignored these pioneering contributions.

Rehn was also interested in the occurrence of bladder tumours in aniline workers in the local factories and at a surgical meeting in 1895 he reported on their

increased incidence in patients living and working in close proximity to the factories. He concluded that inhaling aniline vapours was likely to be the cause – a fact that was denied by the medical practitioner employed by the factory. Although the patients continued to accumulate, Rehn could not prove the correlation although he continued to maintain the relationship until he died.

Despite these very significant contributions, Rehn is best known for being the first to repair cardiac injury by direct suture of the myocardium. Before this time the heart was considered the centre of life and the soul, and untouchable. Stephen Paget (1855–1926) in his book *Surgery of the Chest* had stated the belief that cardiac surgery had reached the limits of nature and that any surgeon who went beyond these limits (and operated upon the heart) was sure to lose the acceptance of his colleagues. Theodor Billroth (1829–94) a few years earlier had also declared a fear of cardiac operation, believing that any twitch of the myocardium would dispatch the patient immediately and certainly this was the general belief at the time.⁴

Rehn demonstrated that operating on the heart was feasible, thus creating a milestone in medical history and proving wrong the Fallopiian aphorism '*Vulnerato corde homo vivere non potest*' ('Man can not live with a wounded heart'). His patient was a young gardener named Wilhelm Justus who had been stabbed in the chest on 7 September 1896 while walking in a park near the Main river in Frankfurt. Rehn being out of town, one of his assistants, Dr Siegel, attended to him. When he returned to the hospital on 9 September Rehn was informed of the stabbing case and, seeing that the young man was dying, Rehn decided to operate in an attempt to save the patient's life. The operation took place in the evening. The 1.5-cm wound in the right ventricle was closed with three silk stitches placed carefully during diastole and the operation was a success. At a surgical meeting in Frankfurt later that year (21–26 September), Dr Rehn introduced the patient.

Six months later, on 22 April 1897 at a surgical meeting in Berlin, he discussed the operation in more detail, describing the difficulties and challenges and he illustrated the surgical technique.^{5,6} Although misgivings and critics still existed,⁷ as is common for new investigations,⁸ this pioneering success is acknowledged to be the worldwide first successful direct suture of the heart – and the beginning of heart surgery.

Rehn maintained research in the cardiac surgical area and published widely.⁹ In 1911 he was nominated Chairman of the German Association of Surgery (Deutsche Gesellschaft für Chirurgie, DGCH) and in 1919 he was named as an Honorary Member of this Association.^{10–12} In 1974 the Chamber of Commerce and industry in Frankfurt founded the Ludwig-Rehn-Award, for scientific publications in general surgery.

Ludwig Rehn concluded in his memoirs 'Going in beaten tracks never aggravated me'.³ However, by going in other tracks frequently he made major contributions in urology, general and cardiac surgery, laying a foundation for many aspects of surgery today. Ludwig Rehn died on 29 May 1930 in Frankfurt, Germany, aged 81 years.

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