

PEPTIC ULCER SURGERY – AN OBITUARY

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Future medical historians may well see the surgery of duodenal ulcer disease as a phenomenon of the twentieth century. By the end of that century, duodenal ulcer incidence continued to fall and treatment for most ulcers consisted of a one-week's course of oral therapy for *H. pylori*. So it was already difficult to believe that during the middle decades of the century, surgical operations for ulcer filled operation lists and research on ulcer disease dominated surgical departments. Yet it was a uniquely twentieth century problem. Although a clear description of the clinical features had been given as early as 1830, the condition was rarely diagnosed in life before the end of the century.

CLINICAL DIAGNOSIS IN THE NINETEENTH CENTURY

While there are records in Greek, Roman and Medieval manuscripts of symptoms which can be interpreted with hindsight as descriptions of duodenal ulcer, the first clear record of the symptoms and pathology was by Sir Benjamin Travers in 1817.¹ In 1830 Dr John Abercrombie, an Edinburgh physician, described in detail seven cases of duodenal ulcer² which included the first accounts of the clinical features, particularly the relationship to meals and localisation of pain in the epigastrium (Figure 1). Abercrombie also described post-mortem findings after fatal haemorrhage, but noted that the 'quantity of blood brought up is often immense – and yet the disease is often not fatal'; he also recognised perforation, describing a specimen in the museum of The Royal College of Surgeons of Edinburgh in which a perforated duodenal ulcer was clearly demonstrated. That specimen remains on display in the College museum today and is shown in Figure 2.

Abercrombie's first clear description of the symptoms of duodenal ulcer disease is worth quoting: 'The leading peculiarity of disease of the duodenum seems to be that the food is taken with relish and the first stage of digestion is not impaired; but the pain begins about the time when the food is passing out of the stomach or about two to four hours after a meal.' Abercrombie's contribution was followed by similar reports from Treir in Copenhagen, and Krause in Berlin.

In 1867 Clark, a physician at the London Hospital, described the clinical features of perforated duodenal ulcer. Mackenzie in 1888 hinted at the epidemic to come in observing that 'duodenal ulcer, although much rarer than gastric ulcer is not so very uncommon as the textbooks would imply'. The turn of the century saw a dramatic rise in the incidence of duodenal ulcer and fall in that of gastric ulcer.

EARLY MEDICAL TREATMENT

The earliest recommendations about treatment were those of Abercrombie² who suggested milk. This view was endorsed by Cruveilhier,³ professor of pathological anatomy in Paris, whose name had eponymously been given to the acute lesser curve gastric ulcer which occurred mainly in

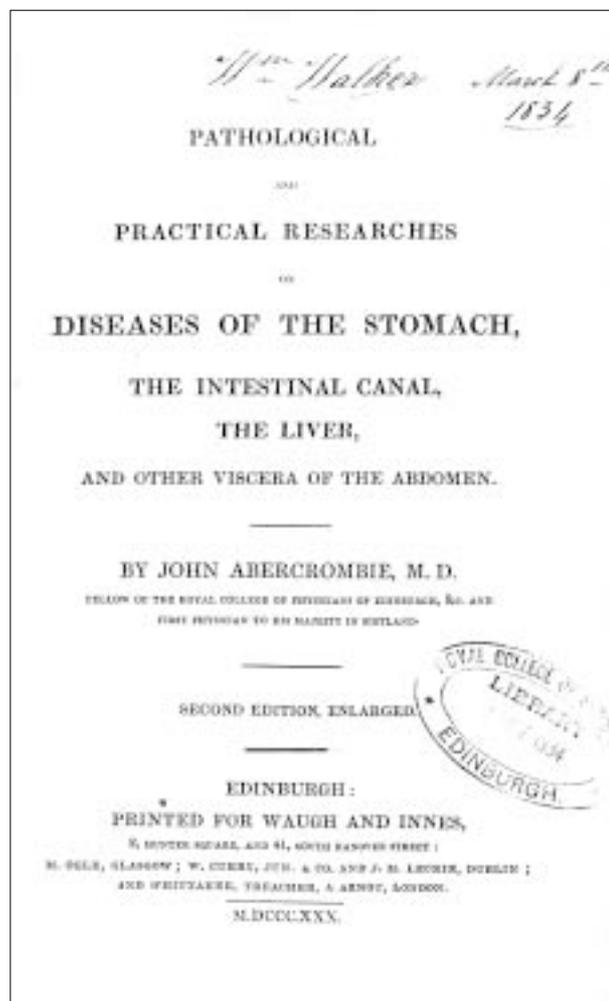


FIGURE 1

Frontispiece of John Abercrombie's book *Pathological and practical researches on diseases of the stomach, the intestinal canal, the liver, and other viscera of the abdomen*.

young women. Brinton⁴ and Fox⁵ were ahead of their time in recommending the use of regular meals and antacids. Sippy,⁶ a Chicago physician, advocated regular bland meals and milk in an effort to ensure thorough and continuous neutralisation of gastric acid and set out the dietary regimen which was to dominate dietary advice for ulcer patients for the next half century. In 1915 he claimed that the results of his regimen were so good as to be 'almost beyond belief'. It took a controlled trial by Doll in 1956 to demonstrate that bland diets did not improve the rate of ulcer healing.⁷

THE DEVELOPMENT OF SURGICAL TREATMENT

The growing body of knowledge about the clinical features

allowed surgeons to diagnose duodenal ulcer with sufficient confidence to operate. The contributions of Mayo-Robson⁸ and of Moynihan⁹ who described both clinical features and operative treatment, proved to be surgical milestones.

The early stomach operations – gastric resection and gastro-enterostomy – devised for the treatment of gastric cancer were first performed successfully in Vienna in 1881, by Billroth and his assistant Wolfler. During the following decade, these operations were applied to duodenal ulcer. At the start of the century, as duodenal ulcer was diagnosed by clinicians with increasing confidence, gastro-enterostomy became the surgical procedure of choice. In the first decade of the twentieth century the advocacy of gastro-enterostomy by Moynihan in Britain and by Mayo¹⁰ in the USA helped ensure the predominance of this procedure in the treatment of duodenal ulcer for the next 30 years.

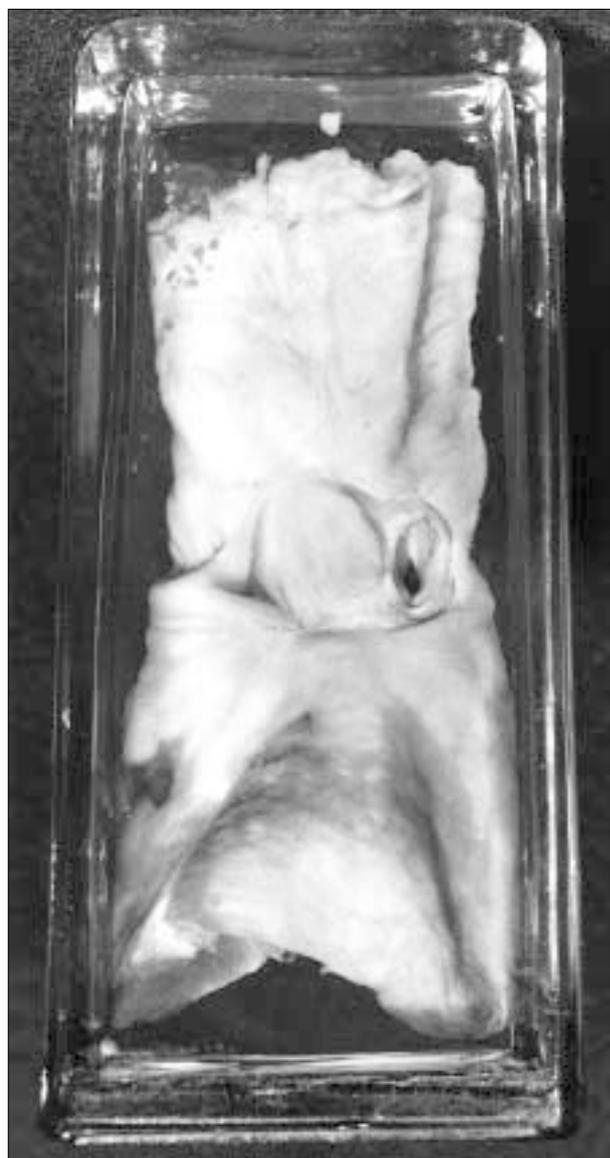


FIGURE 2
Specimen of a perforated duodenal ulcer held in the museum of The Royal College of Surgeons of Edinburgh.

The problem of stomal ulceration was described soon after the introduction of the procedure, yet it was not until the 1920s that this was shown to be a common problem. In the course of the next decade an increasing number of surgeons, notably Polya in Hungary, von Haberer in Germany and Lewisohn in the United States, began to recommend gastric resection for the treatment of chronic duodenal ulcer. In the 1930s in continental Europe and the USA, and in the 1940s in Britain, gastrectomy gradually superseded gastro-enterostomy as the preferred operation.

The incidence and prevalence of duodenal ulcer had continued to rise until the mid 1950s in both the USA and UK. By the middle of the twentieth century it had reached virtual epidemic proportions, affecting some 10% of the population of the UK at some time in their lives. Research into its aetiology and treatment came to dominate surgical departments throughout the Western World in the 1940s and 1950s.

As understanding of the physiological control of gastric secretion increased, so operations based on decreasing vagally- and antrally-mediated acid output were introduced. Dragstedt, a Chicago surgeon reported in the 1940s on truncal vagotomy with a drainage procedure, an operation which gained in popularity over the next quarter century.

Thereafter the incidence and prevalence of duodenal ulcer began to decline, and that decline continues. Paradoxically the onset of this decline coincided with the widespread introduction of more physiologically sound surgical operations with fewer side-effects; the emergence of the long-term sequelae of gastric resection had added impetus to the search for safer procedures. Truncal vagotomy and drainage became the favoured surgical procedure for duodenal ulcer in the 1960s in the UK and in most of Europe despite the inherent problems of gastric incontinence (from the drainage procedure), and of parasympathetic denervation of the entire gastro-intestinal tract (from truncal vagotomy). Selective vagotomy was developed by Griffith and Harkins in the late 1950s, and in turn led to the description of highly selective vagotomy by Johnston and by Amdrup in the late 1960s. This was to become the favoured procedure, particularly in European centres, throughout the 1970s and 1980s. The most popular operations for peptic ulcer are now considered in the order of their introduction into clinical practice.

THE COMMONER SURGICAL OPERATIONS

Gastrectomy

The first published account of gastric resection was that of Christian Michaelis, Professor of Surgery at Marburg University 1786-1814. Aware of the problem of gastric outlet obstruction he attempted – unsuccessfully – to resect the pylorus in experimental animals. However, in 1810 his pupil Daniel Merrem performed, in an animal model, successful resection of the distal stomach with restorative anastomosis to the duodenum.¹¹

The first gastric resection in man was performed by Jules Pean, (Figure 3) a Parisian surgeon who had carried out the first successful splenectomy in 1867. In April 1879 Pean¹² performed what amounted to a pylorotomy for a carcinoma at the pylorus, but the patient did not survive.

Credit for the first planned gastric resection in man is given to Ludwig Rydygier (Figure 4). Born in Poland in 1850, he studied medicine in Berlin where he received his MD thesis in 1874 for investigations into the effects of

carbolic acid.¹³ He was familiar with the advances in antiseptics and anaesthesia as well as being well versed in experimental technique: a series of gastric resections in dogs preceded his operations in man. On 16 November 1880 he performed a limited gastric resection with a two layer gastro-duodenal anastomosis on a patient with an antral cancer. As with Pean's original effort, Rydygier's operation was not successful, the patient dying 12 hours after the procedure.¹⁴



FIGURE 3
Jules Pean.

The first successful gastrectomy

It was the name of Theodor Billroth (Figure 5) that will forever be eponymously associated with gastric resection; his was the first successful gastric resection, the patient surviving for four months. Billroth and the school which he established laid the foundations upon which gastric surgery was built. Billroth was born in 1829 at Bergen, on the island of Rugen just off the North German Coast; from his early years he had shown a love of music and was a gifted pianist. Although he wished to pursue a career as a musician, his mother had decided that he should become a doctor, yet throughout his life he never relinquished his enjoyment of music. He became a close friend and confidant of Johannes Brahms (Figure 6) and many of the young surgeons he chose as assistants were also talented musicians.¹⁵ The family moved to Griefswald where Billroth began his medical studies in 1848. After studying for three years at Gottingen, Billroth qualified in medicine from Berlin in 1852. Langenbeck (whose retractor remains in worldwide use today), the leading German surgeon of his day, and von Graefe (of corneal scalpel fame and founder of modern

ophthalmic surgery) attracted him to a surgical career.¹⁶ In 1860 Billroth became the Professor of Surgery in Zürich and here, by meticulous collection of his results and their presentation before his contemporaries, he laid the foundations for surgical audit. He was the first clinician to systematically record patient temperature and to record the results of operations, not only in terms of in-patient, but also five-year outcome.

In 1867 Billroth accepted the Chair of Surgery in Vienna. This appointment of a Prussian, coming as it did just one year after the defeat of the Austrian armies at the hands of the Prussians at Sadowa, was not an easy decision either for Billroth or for the faculty in Vienna where anti-Prussian feeling was high. Gersterer, an American surgeon who studied at Billroth's clinic, later speculated that his move to Vienna was to join Brahms who had moved there one year earlier.¹⁷ Whatever the reason behind it, with this move to Vienna began one of the most productive and important periods – perhaps the single most important – in the history of gastric surgery. The foundations for the many surgical innovations which Billroth's school was to produce were laid on firm scientific principles. In 1878 his first assistant Wolfler was sent to Lister's Edinburgh clinic, and when he returned, the principles of antiseptics were adopted in Vienna.

The concept of gastrectomy was first tested in the animal laboratory by two of his assistants, Gussenbauer and von Winiwater, in 1874. They performed what has come to be known as a Billroth I gastrectomy and obtained long-term survival in two of seven dogs. Having demonstrated that the technical problems could be overcome, they moved on to assess the feasibility of resecting gastric tumours in man.



FIGURE 4
Ludwig Rydygier.

In an autopsy study they found that 223 (41%) of 542 pyloric tumours had no macroscopic metastases and that 43% were mobile.¹⁸

These preliminary studies paved the way for the first planned and successful gastric resection. In 1877, following success with the first gastrorrhaphy, Billroth felt sufficiently confident to predict that 'No insurmountable obstacles to partial excision of the stomach exist, either on anatomical or physiological grounds. It must succeed.' That first successful gastrectomy was performed by Billroth on 20 January 1881. Ziegler,¹⁹ in a subsequent review of the operation records, described the lengthy pre-operative gastric lavage lasting one and a half hours. The procedure was performed under chloroform anaesthesia, and all drapes and sutures soaked in carbolic, although Lister's carbolic spray was not used. A transverse abdominal incision was made. The duodenum was divided 1.5 cm distal to the tumour and anastomosed to the stomach with carbolised silk. The patient recovered well, only to die of tumour recurrence some four months later. Billroth in his *Offenes Schreiben*²⁰ emphasised the preparation which had led up to this first successful gastrectomy and gave an insight into his standards when he wrote 'Gastric resection like any other operation has been fully prepared anatomically, physiologically and technically by my pupils and myself'. By 1890 some 41 gastrectomies had been performed at Billroth's clinic with 19 operative successes.

Billroth was to become the outstanding surgical figure of his time – the father of surgical audit, and the father of abdominal surgery were accolades that have stood the test of time. The famous portrait by Seligmann shows Billroth operating in Vienna in 1890 with Anton von Eiselsberg on his left (Figure 7).



FIGURE 5
Theodor Billroth.



FIGURE 6

Theodor Billroth, in light trousers, with Johannes Brahms to his right. This is one of only two photographs of the two men together.

Gastrectomy for peptic ulcer

Ludwig Rydygier performed the first gastric resection for peptic ulcer. Like Billroth, whom he had visited in Vienna, his surgical innovations were based on preliminary laboratory research. He performed a successful resection in November 1881 for a prepyloric peptic ulcer. Rather than praise, this triumph at first attracted cynical critique. His account²¹ of this first gastrectomy for ulcer was accompanied by an editorial footnote '*Hoffentlich auch letzte*' (Hopefully also the last!).

Far from being the last it was the start of a new era of surgical treatment. Billroth in 1885 performed the first major modification of gastrectomy – duodenal stump closure and gastro-jejunal anastomosis – the 'Billroth II' procedure or 'Polya' gastrectomy. It was perhaps inevitable that it was at Billroth's clinic that first refinement to the technique of gastrectomy – that of a gastro-jejunal anastomosis – was made. As experience with the procedure increased so the mortality from Billroth I gastrectomy continued to fall; by 1890, the operative mortality in Billroth's clinic was around 50%. The next decade saw improvements in surgical technique and postoperative care which progressively reduced this operative mortality.

Billroth I gastrectomy

In the years after the Second World War the increasing understanding of the physiology of gastric secretion enabled several investigators to test the scientific basis of the various operations for ulcer. Salmon measured gastric and duodenal pH in dogs after Billroth I or Billroth II gastrectomy. Whilst gastric pH was similar after each procedure, duodenal pH was significantly more acidic after Billroth I.

The Billroth I procedure's mortality and long-term morbidity, however, combined with the high rate of ulcer recurrence rendered this operation obsolete in all but a few centres. The ulcer recurrence rates were high – 13–28% in a major series – after Billroth I resection. The advocacy of gastroenterostomy by two influential surgeons, Monyihan²² in Britain and Mayo¹⁰ in the USA, was to seal its fate.

A few surgeons, however, continued to practice Billroth I



FIGURE 7
Theodor Billroth (right) and Anton von Eiselsberg.

gastrectomy for duodenal ulcer – most notably von Haberer (Figure 8) – who had published the results of his initial experience in 1919.²³ By 1947²⁴ he was able to report a vast personal series of 3,602 gastrectomies for duodenal ulcer, of which 2,152 were Billroth I. He claimed that in 1,644 consecutive Billroth I gastrectomies recurrence was observed in only 12, a rate of 0.7%. He continued to publish until 1952, some 37 years after his first contribution,²⁵ but his was an idiosyncratic experience.

Billroth II (Polya) gastrectomy

Billroth's modification of the original gastrectomy involved closing the divided antrum with a row of sutures and performing an anterior gastro-enterostomy. Many variations were subsequently described and the following account is limited to those which are considered, in retrospect, to have improved the technique or to have been widely practised.

Early variations to the original Billroth technique were described by Krolein,²⁶ Hofmeister²⁷ and Jaboulay.²⁸ Von Eiselsberg, a pupil of Billroth (seen next to him in Figure 7) described in 1889 the closure of the divided proximal stomach and linear gastrotomy to allow for a smaller gastro-jejunal stoma.²⁹ Credit for this variation has been ascribed to Polya of Budapest whose report in 1911 was given widespread exposure by Mayo.

During the period up to the end of the First World War a number of modifications to the Billroth II gastrectomy had been described – almost all of them by continental surgeons with Hofmeister, Polya, von Haberer and Finsterer making the most important contributions. Polya's description of a retrocolic anastomosis, with the advantage of the short afferent loop, and a gastro-jejunal anastomosis along the length of the divided stomach with no valvular arrangement, was to gain him eponymous fame.

Although Polya performed over 2,000 of these resections for duodenal ulcer during his working lifetime, the operation took some time to become established.

Moyhihan was a powerful advocate of gastroenterostomy. His boast of 'only one death in the last thousand cases'³⁰ must have been a powerful argument against gastrectomy whose mortality in the best hands was of the order of 20% in that period, and for the average surgeon presumably even higher. For all his massive contribution to surgery it would seem that accurate follow-up was not among them.

THE SCIENTIFIC BASIS OF ANTRAL RESECTION

Furthermore, although Edkins had in 1906 described a substance isolated from the antral mucosa which, when injected into the jugular vein, increased acid output and which he called gastrin,³¹ yet surgical thinking was slow to follow the logic that removal of the antrum would reduce acid output. For example, Cook writing from Chicago some 40 years later referred to the 'yet unproven Edkins theory', this despite the maxim of 'no acid no ulcer' which had been described as early as 1910 by Schwarz.³² By the 1940s research into antral function was following two distinct lines. Dragstedt concentrated on the *function* of the antrum by excluding, isolating and denervating it, while groups like those of Gregory in Liverpool pursued gastrin secretion by the antrum, defining its structure by 1964. The role of the antrum in acid production was not appreciated until relatively late, so it is easy to understand why the Billroth II resection was slow to find favour in the USA and even slower in Britain. Lewisohn's results³³ published from the Mount Sinai Hospital, New York in 1925 showed gastrectomy in a favourable light compared to a 34% recurrence rate after gastro-enterostomy; this began to sway surgical opinion in the USA toward gastrectomy. Strauss and his colleagues³⁴



FIGURE 8
Hans von Haberer.

reported a series of subtotal gastrectomy in 1930 with a 5.4% mortality rate. Despite this, even by 1935 at the Mayo clinic less than 10% of operations for duodenal ulcer were gastric resections with gastro-enterostomy accounting for more than 70%. These ratios were to reverse over the next 15 years.

In the years after the Second World War increasing disenchantment with the rate of stomal ulceration following gastro-jejunosomy resulted in Billroth II resection becoming widely adopted throughout Europe and America as the operation of choice. In Britain, as a result of wartime service, more surgeons came under the influence of Heanage Ogilvie, a committed gastrectomist for duodenal ulcer since the mid 1930s. Wells³⁵ records that from 1945 Billroth II resection rapidly supplanted gastro-enterostomy as the commonest operation for duodenal ulcer in Britain.

To be continued. Part two will be published in the August issue of *Proceedings*.

REFERENCES

- 1 Travers B. Additional observations. *Med Chir Trans Lond* 1817; 8:231-45.
- 2 Abercrombie J. In: *Pathological and practical researches on diseases of the stomach, the intestinal canal, the liver, and other viscera of the abdomen*. Edinburgh: Waugh and Innes; 1803:103-8.
- 3 Cruveilhier J. *Maladies de l'estomac*. Paris: Balliere; 1842.
- 4 Brinton W. *History of the stomach*. London: Churchill; 1857.
- 5 Fox W. *Diseases of the stomach*. Third edition. Philadelphia: Henry Lea; 1875.
- 6 Sippy BW. Gastric and duodenal ulcer. Medical cure by an efficient removal of gastric juice corrosion. *JAMA* 1915; 64:1625-30.
- 7 Doll R *et al*. Dietetic treatment of peptic ulcer. *Lancet* 1956; 1:5-9.
- 8 Mayo-Robson A. On the surgery of the stomach. *Lancet* 1900; 1:671-84.
- 9 Moynihan BGA. *Duodenal ulcer*. Philadelphia and London: WB Saunders; 1910.
- 10 Mayo WJ. Duodenal ulcer. A clinical review of fifty-eight operated cases with some remarks on gastrojejunosomy. *Ann Surg* 1904; 40:900-8.
- 11 Merrem DKT. *Animadversiones quaedam chirurgicae experimentales in animalibus*. Giessen: Tasche und Muller; 1810.
- 12 Pean JE. De l'ablation des tumeurs de l'estomac par la gastrectomie. *Gazette de l'hospital de Paris* 1879; 52:473-5.
- 13 Rudowski W. *Surgery of the stomach and duodenum*. Fourth edition. Ludwik Rydygier in Nyhus LM, Wastell C (eds). Boston: Little, Brown; 1986: 41.
- 14 Rydygier L. Extirpation des carcinatosen pylorus: tod nach zwölf stunden. *Dtsch Z Chir* 1880/1; 14:252-60.
- 15 Mendelbaum I. Theodore Billroth and the beginning of gastric surgery. *J Mt Sinai Hospital* 1957; 24:112-23.
- 16 Sigerist HE. In: *The great doctors*. New York: Dover Publications; 1971: 380-3.
- 17 Gersterer AGC. *Reflections of a New York surgeon*. New York: PB Hoefer; 1917.
- 18 Gussenbauer V, Winiwater A. Die partielle magenresektion. *Arch Klin Chir* 1876; 19:347-51.
- 19 Ziegler H. Billroths erste magenresektion. *Krebszeit* 1959; 4:49.
- 20 Billroth CAT. Offenes schreiben an Herrn Dr L Wittelshofer. *Wien Med Wechnschr* 1881; 31:161-2.
- 21 Rydygier L. Die erste magenresektion beim mageneschwur. *Berl Klin Wechnschr* 1882; 19:39-41.
- 22 Moynihan BGA. A clinical lecture on duodenal ulcer. *Med Press* 1908; 137:110-2.
- 23 von Haberer H. Zur therapie aktuer geshwursperforationen des magens und duodenum in die freie bauchhohle. *Wien Klin Wechnschr* 1919; 32:413-6.
- 24 von Haberer H. Ulcus pepticum jejuni und rueckfallgeschwuer. *Zentrabl Chir* 1947; 72:496-502.
- 25 von Haberer H. Ulcus jejuni postoperativum nach resektion Billroth II. *Chirurg* 1952; 23:164-6.
- 26 Krolein RV. Implantation des magenlumens is das ileum. *Corr Schw Aertze* 1888; 18:317.
- 27 Hofmeister F. Beitrax zur magen-chirurgie. *Beitz Z Klin Chir* 1908; 59:551-5.
- 28 Jaboulay M. La gastro-enterostomie. La jejunoduodenostomie. La resektion du pylore. *Arch Prov Chir* 1892; 1:1-22.
- 29 von Eiselsberg A. Zur unilateralen pylorus. *Wien Klin Wechnschr* 1910; 23:44-6.
- 30 Moynihan BGA. A lecture on the prognosis of gastric and duodenal ulcer. *Brit Med J* 1932; 1:1-3.
- 31 Edkins JS. The chemical mechanism of gastric secretion. *J Physiol* 1906; 34:183.
- 32 Schwarz K. Ueber penetrier ende magen und jejunalgeschwure. *Beitrag zur klinischen chirurgie* 1910; 67:96-128.
- 33 Lewisohn R. The frequency of gastrointestinal ulcers. *Surg Gynec Obstet* 1925; 40:70-6.
- 34 Strauss AA, Bloch L, Friedman JC *et al*. Subtotal gastrectomy for duodenal ulcer. *JAMA* 1930; 95:1883.
- 35 Wells CA. In: *Peptic ulceration*. Wells C, Kyle J (eds). Edinburgh and London: E & S Livingstone; 1960:88-9.