

From the history of medicine

ONE HUNDRED YEARS OF MILES' OPERATION- WHAT HAS CHANGED?

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Lisfranc was probably the first to excise the rectum for cancer. He performed operation using perineal approach in 1826. This operation came into common use fifty years later. Czerny did the first combined abdominoperineal resection in attempt to finish excision he could not complete from below. Some fifteen years later Ernest Miles described the planned, one-stage abdominoperineal resection.

Miles name has become a synonym for this combined procedure, creating a radical change in the philosophy of resection and *en bloc* lymphadenectomy.

At the beginning of the 20th century, abdominoperineal resection became golden standard in the treatment of rectal cancer. Reconstructive operations, introduction of stapling devices and better understanding of potential tumor spread, reduced indications for Miles operation.

Surgical treatment of rectal cancer made progress in the past 100 years. Miles was the first in line. Without his theory of perirectal lymphatic spread, the recurrence rate would be still as high as 95%. *Acta Medica Medianae* 2008;47(4):43-46.

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BIOGRAPHY

William Ernest Miles was born in the town of Uppingham, in Rutland, the smallest county in England, in 1869. Soon after his birth, his parents went to Port of Spain, Trinidad, where his father William Miles became the headmaster of Queens Royal College (1).

He attended medical school at St Bartholomew's in London where he finished his education in 1891. Three years later, he obtained surgical fellowship and until 1899 served as a demonstrator of anatomy (2). Miles was a pupil of Harrison Cripps known for his work on rectal pathology who was the first to describe metastasis as disseminations of the primary tumor through blood or lymph vessels. Those were the years when Miles began his investigation of rectal cancer metastasis. He worked as house surgeon at St. Mark's Hospital and Metropolitan Hospital. During this time, he became associated with David Goodsall. He collaborated with him in writing a textbook on "Diseases of the Rectum and Anus" (published in 1900). Miles was later appointed to the surgical staff of the Gordon Hospital for Rectal Diseases. Miles' surgical reputation rendered this hospital a world center of rectal surgery attracting surgeons such as Mayo brothers and Lord Moynihan (1, 3, 4).

Sir Miles died in London on September 24, 1947. In appreciation, Mr. Lawrence Abel, one of

his colleagues, wrote: "So long as cancer of the rectum can only be cured by the surgeon, Miles' name will be honored for the pioneer work he did and for the firm foundation of pathology and splendid superstructure of finished technique he has bequeathed..."(2).



Figure 1. William Ernest Miles

The birth of abdominoperineal resection

Jean Faget performed probably the first perineal resection accidentally in 1739 for complications of perforated rectal cancer presenting as bilateral ischiorectal abscess. Jacques Lisfranc performed the first perineal resection for rectal cancer in 1826. The main problem of perineal and later on sacral approaches (developed by Kocher and Kraske (5, 6), was limited exposure of operative field making radical removal of the tumor almost impossible.

Table 1. Review of abdominoperineal resection development

Series	Series 1	Series 2	Series 3	Series 4
Year	1899-1901	1902-1904	1904-1905	1905-1906
Number of pts.	9	14	11	17
Recurrence rate	100%	100%	100%	100%
Localization of recurrence	Skin and ischioanal fat	The zone of lateral spread	The zone of upward spread	The zone of upward spread
Average time to recurrence	12 months	/	/	27 months

Peritonitis was the main cause of death after perineal resection. Two important developments enabled performing laparotomy. First, the development of anesthesia with muscle relaxation, and second, introduction of principles of asepsis by Joseph Lister.

Finally, in 1879, Carl Gaussbauer performed the first resection through abdominal approach. Henri Hartmann, a French surgeon, propagated this method for high rectal cancers. The so-called Hartmann procedure is still performed for emergency or palliative procedures and in rare cases for curative resections, but above all it is a standard practice for acute perforated diverticulitis.

By the end of the 19th century, cellular basis of disease was commonly accepted, but the etiology of cancer was less understood. Until then, scientists believed that metastases were multifocal, de novo development of cancer. As a pupil of Cripps, Miles developed his idea further (3).

Like Halsted with carcinoma of the breast, Miles studied the lymphatic spread of rectal cancer in planning his operation and demonstrated that the main danger was spreading in an upward direction, but that lateral and downward extension must not be overlooked (7).

In the period 1899-1906, he performed 57 perineal resections. 95% of patients had early recurrence (within first six months). Unsatisfied with the results, he carried out with postmortem examinations in attempt to define the nature of perirectal lymphatic spread. He found recurrences in the pelvic peritoneum, mesocolon and lymph nodes around left common iliac artery (4, 8).

He stated this in original work published in 1908:

..."So far as I have been able to gather from the literature, the technique of these operators seems to have failed in one important aspect - namely, the complete eradication of the zone of upward spread of cancer."... (8).

It took him seven long years to develop abdominoperineal resection, Table 1.

Despite modifications to his surgical technique, the recurrence rate was still 100%, but the time to recurrence was encouraging. It was now clear to Miles that if he was ever to achieve good results he must find a new approach to enable him to clear all the tissues in the zone of upward spread (9).

Removal of the rectum by combined abdominal and perineal approach had been performed before (1884) by Vincent Czerny. However, this was not planned. He was forced to

do so to resolve the complications that occurred during the sacral resection of proximal tumor. The patient did not survive the procedure (3). However, with improvements in supportive therapy hemorrhage and shock became more controllable. Miles got an idea. Adding laparotomy to perineal approach enabled resection of zone of upward spread. Abdominoperineal resection was born. First Miles' operation was performed in January 1907 (2, 9). (Figure 2).

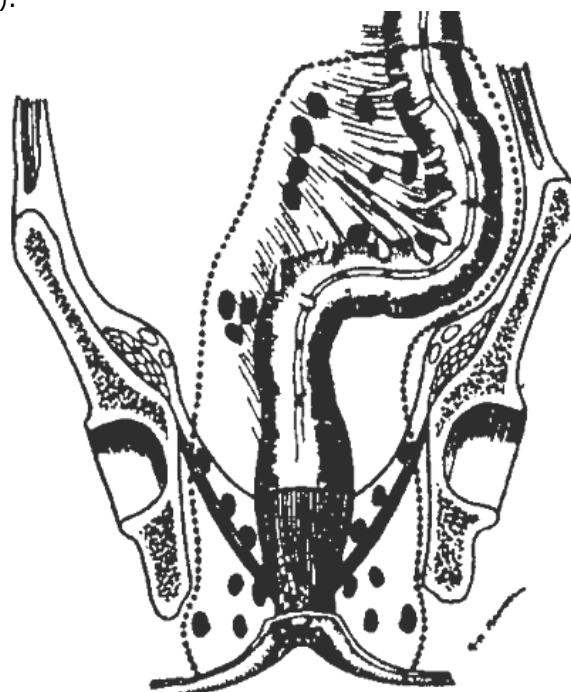


Figure 2. Extent of Miles operation and zones of spread (adapted from: Miles W. E. Cancer of the Rectum. London: Harrison and Sons (1926) (10)

As described by Miles, abdominoperineal resection entails:

(1) creation of abdominal anus; (2) whole pelvic colon with the exception of the part from which the colostomy is made must be removed because its blood supply is contained in the zone of upward spread; (3) the whole of the pelvic mesocolon below the point where it crosses the common iliac artery, together with a strip of peritoneum at least an inch wide on either side of it, must be cleared away; (4) the group of lymph nodes situated over the bifurcation of the common iliac artery are in all instances to be removed; (5) that the perineal portion of the operation should be carried out as

widely as possible so that the lateral and downward zones of spread may be effectively extirpated; (8).

By December 1908, Miles had published results of his first 12 cases. Five of his patients died. Later on, he improved his results to 15% mortality by the end of his career. According to his later papers from 1912, we can calculate that at least three out of seven patients from the first series had survived without recurrence over 4 years (9). In his paper from 1923 he reported a recurrence rate of 29.5%. Miles had finally achieved a long-term recurrence free survival, which was his primary goal.

Further improvements of Miles' operation

Miles' abdominoperineal resection (APR) gained widespread approval and became a gold standard in the treatment of rectal cancer. In the beginning, several surgeons, including Miles, performed abdominoperineal resection as a two-stage procedure in order to reduce mutilating nature of the procedure. The improvement of anesthesia and intensive care enabled surgeons like Lloyd-Davis and Quenu to carry out APR as one-stage operation.

In original procedure Miles proposed ligation of vascular supply below the left colic artery. Moynihan claimed that applying low ligation atypical group of lymph nodes close to inferior mesenteric artery could be the source of metastases in the future. He propagated high ligation, near aorta. This controversy has not been resolved yet (3).

The main disadvantage of abdominoperineal resection was the necessity of permanent colostomy. Up till 1948 all rectal cancers irrespective of tumor height were treated with this procedure. In 1948, Claude Dixon presented his results on 400 patients treated with anterior resection (maintaining bowel continuity). Anterior resection (AR) displaced APR for middle and upper thirds rectal cancers (11). Although APR entailed permanent colostomy, it allowed the cure of many patients with low rectal cancer (12).

One other dilemma appeared. Lateral and downward lymphatic spread, as proposed by Miles, was challenged relatively recently by Heald and colleagues in their view of principally upward lymphatic spread within mesorectal sleeve. In 1982 Heald introduced total mesorectal excision (TME), which involved en bloc resection of the tumor and mesorectum. According to Heald, principal predictor of cure is the completeness of the mesorectal specimen. The use of sharp dissection replaced the manual extraction in the past: traction on the specimen must be gentle. In his series from 1978- 1997 on more than 519 patients, only 7% of the 519 patients had Miles operation. According to some authors (12, 13, 14), the conventional APR makes TME more difficult and imprecise, with an increased risk of tearing the surface of the specimen. Those are the main reasons for higher rate of local

recurrence and poorer survival in APR compared to AR (13).

Although spread of rectal cancer is most commonly by extramural invasion into the mesorectum, recent pathological studies on total mesorectal excision (TME) specimens have demonstrated that downward and lateral spread is more common than previously thought, with increasing depth of extramural invasion leading to colorectal cancer positivity (15).

Recently, more radical APR has been described by Holm where low rectal cancer is removed from below using a wide perineal resection. This resembles the approach used by the surgeons at the end of twenty century (14).

Japanese authors are reviving the idea of Dedish from 1950 of lateral lymph node dissection. This technique is abandoned in Europe, but according to the papers from Japan it's improving local control and survival (16). The same Japanese authors (Hojo and Moriya) developed a concept of nerve preserving rectal resection since damage to the autonomic innervations of urogenital organs is a major problem in mesorectal excision. Nowadays, training in TME considers nerve-preservation technique (17).

Better understanding of the potential spread of the tumor, the introduction of the staple devices, which made coloanal anastomosis possible, as well as the introduction of potent adjuvant therapy, has led to tremendous improvements in surgery for patients with low rectal cancer (18).

Reconstructive operations and stapling devices reduced indications for Miles' operation.

In modern rectal cancer surgery, the state-of-the-art technique is to avoid a permanent colostomy whenever possible. Many studies have indicated that a permanent stoma has a detrimental effect on perceived quality of life. However, these findings are inconsistent, and some recent studies found even better quality of life in patients who received an abdominoperineal resection than in those who received an anterior resection (19). Unfortunately, recent studies are reporting disappointing outcome of 10% local recurrence rate after APR (20). There is an open question: Do we need wider perineal and pelvic floor resections accompanied with TME? Here we are getting back to the origin.

Analyzing results of original Miles' operation that has been done by his pupil Abel on 200 cases with data from South Australian Teaching Hospital or data from study in Leeds (United Kingdom) (9, 20), we can see that the results from operation devised 100 years ago are indeed comparable. In a series by Abel, a 5-year survival is 53%, SA teaching Hospital 56% and UK 65.8%. How far do we have to go to achieve better results?

Surgical treatment of rectal cancer made progress in the past 100 years. Miles was the first in line. Without his theory of perirectal lymphatic spread, the recurrence rate would be still as high as 95%.

Conclusion

William Ernest Miles lived and worked at the time when evidence-based surgery was still an unknown issue. He studied the operative treatment of disease which almost always led fatal outcome. With careful audit on his results and great knowledge of anatomy and pathology

combined with intuition and open mind, he developed the operation that became foundation of all procedures for curing rectal cancer.

Even today, abdominoperineal resection that bears his name, with some minor technical changes, has its place in the surgery of rectal cancer.

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STO GODINA OD MILES-OVE OPERACIJE - ŠTA SE PROMENILO?

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Smatra se da je Lisfranc prvi resecirao rektum zbog karcinoma. Operaciju je izveo korišćenjem perinealnog pristupa 1826. godine. Ovakva tehnika je opšte prihvaćena tek pedeset godina kasnije. Czerny je prvi primenio kombinovan abdomino-perinealni pristup pokušavajući da završi eksciziju koju nije mogao da izvede perinealnim aktom. Petnaestak godina kasnije, Ernest Miles je prvi opisao planiranu, abdominalnoperinealnu resekciju u jednom aktu.

Milesovo ime je postalo sinonim za ovu kombinovanu tehniku i donelo radikalne promene u filozofiji resekcije tumora rektuma i en bloc limfadenektomije. Početkom dvadesetog veka abdominoperinealna resekcija je široko prihvaćena kao zlatni standard u lečenju karcinoma rektuma.

Rekonstruktivne operacije, upotreba mehaničkih šivača i bolje razumevanje potencijalnog širenja tumorskog procesa, smanjili su indikaciono područje Miles-ove operacije.

Načinjen je veliki progres u hirurškoj terapiji karcinoma rektuma u poslednjih 100 godina. Miles je svakako bio pionir na ovom polju. Bez njegove teorije limfogenog širenja stopa recidiva bi i danas iznosila 95%. *Acta Medica Medianae* 2008;47(4):43-46.

Cljučne reči: William Ernest Miles, abdominoperinealna resekcija, karcinom rektuma