



Hartmann's operation 100 years later: Time to think and stop?

Samara Hassranah ^{a,*}, Vijay Naraynsingh ^b, Patrick Harnarayan ^b, Dave Harnanan ^b, Shamir Cawich ^b, Yardesh Singh ^b, Shariful Islam ^c

^a Department of Surgery, Medical Associates Hospital, St. Joseph, Trinidad and Tobago

^b Department of Clinical Surgical Sciences, The University of the West Indies, St. Augustine, Trinidad and Tobago

^c San Fernando General Hospital, Trinidad and Tobago

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ABSTRACT

When Henri Hartmann invented his operation in 1921, his intent was not for use in benign disease but as an alternative for Miles' abdominoperineal resection which, at that period, had a high mortality rate. With advancements in medicine, Hartmann's procedure was replaced by abdominoperineal resection which had a significant drop in mortality. In the 1980s to the 1990s, however, there was a renewed interest in Hartmann's procedure as an alternative management for perforated diverticular disease leading to the formation of guidelines that advocated its use. Since then, resection with primary anastomosis has replaced Hartmann's as the standard of care and with the alternative operations available for colorectal cancers, the place for Hartmann's operation in medicine should be clearly defined.

Introduction

We propose the hypothesis that 100 years after its invention, Hartmann's procedure no longer has a role in colorectal surgery. In 1921, Henri Hartmann described a new technique for the removal of tumours in the distal colon. His procedure improved upon the mortality rates of patients who were operated on for rectal tumours but since its invention, his procedure is now hardly ever utilised for carcinoma. It is now, however, widely performed in the treatment of perforated diverticulitis but even this practice is currently being questioned. We discuss the history of the procedure and examine its place in the future of colorectal surgery.

Background to hypothesis

History of rectal tumour surgery

Sir W. Ernest Miles was disappointed with the morbidity of the solely perineal resection popular at the time. He documented among his patients a 94.7 % recurrence rate by the third year postoperatively and in 1908, he published his case series of 12 abdominoperineal resections (APR) [1]. His stepwise description of the APR and his theories of how colorectal cancer spreads led to it becoming a standard operation in the

treatment of rectal cancers, but the postoperative mortality rate was still relatively high [1,2]. In fact, in Miles' original description, 5 of his 12 patients died (mortality 41.6 %) [1].

Henri Hartmann invented his procedure for proximal rectal tumours aiming to reduce the high mortality and complication rates of an APR [3]. He presented his approach for rectal cancers in 1921 at the 30th Congress of Surgery in Strasbourg, France [4]. In 2 patients who already had colostomies for surgeries to relieve obstruction, he resected the 'segment of colon ... proximal to the anus and rectum'. He 'then closed the superior part of the rectum and left it in the peritoneum without disturbing the perineal floor' [4]. In 1924, Hartmann then presented the procedure to the Society of Surgery in France [5]. Ten patients with rectal cancers were operated on with 1 death unrelated to cancer. He commented on the morbidity associated with the permanent stoma but his patients preferred not to reverse them due to the potential surgical risks [5]. Due to this reduced morbidity and mortality, the Hartmann procedure rose in popularity for rectal cancer. However, his operation, at that time, was not done for perforated diverticular disease.

The re-popularisation of APR

Electrocoagulation, antibiotics and safe blood transfusion allowed surgery for APR to become safer as patient morbidity and mortality

Abbreviations: APR, Abdominoperineal resection.

* Corresponding author.

E-mail address: samara.hassranah@live.com (S. Hassranah).

decreased.

William Bovie's interest and work in the biophysics of electrocautery was essential to the advancement of haemostasis during surgery; this reduced blood loss significantly, thus decreasing post-op complications [6].

The 20th century heralded in the next level of infection management, antibiotics. Alexander Fleming serendipitously discovered penicillin in 1928 but his work was met with little fanfare and it was not until 1939 that Florey and Chain were able to mass produce it for routine medical use [7].

Blood transfusion, though attempted intermittently through medical history remained unsafe until Karl Landsteiner defined the ABO blood grouping in 1901. This was further refined with his identification of the Rh groups in 1939. In 1921, Percy Oliver started the first voluntary blood donation service which was the forerunner to blood donation during the Spanish Civil War and World War II [8].

Minimizing blood loss with electrocautery, giving blood transfusions when necessary and the judicious use of antibiotics, all contributed to decreasing the mortality of the APR. Modern resuscitative measures, intravenous fluids, safe peripheral access and vasoactive drugs allowed surgeons more control over perioperative care; thus, APR had a decreased mortality rate. Combined with this, improvements in technique, such as Lloyd-Davies' addition of the simultaneous abdominal and perineal resections in 1939, allowed the surgery to regain popularity and the role of the Hartmann's procedure decreased significantly [9].

APR has ironically replaced Hartmann's operation as the safer procedure because of its better oncologic clearance especially for low tumours. In 2020, Christou et al reported, in their retrospective study of 240 patients, that Hartmann's procedure had a mortality rate of 4.29 % within 1 month of surgery but noted a high morbidity of 42.8 % by 3 months post operation [10]. Nair et al reported in their 2021 retrospective cohort study of 54 patients that those who had an ultra-low Hartmann's (ULH) had a 14 % rate of severe complications compared to 2.5 % in those with APR. Twenty-one percent of patients with an ULH developed pelvic collections compared to only 2.5 % in the APR group [11]. Hallam et al found that only 47 % of stomas were reversed with an average reversal time of 11 months [12]. Thus, unlike the 1920s, Mile's APR is now established as a safer and better procedure than Hartmann's operation. With advances in surgical technique, low anterior resections (LAR), laparoscopic and robotic surgery, stapling techniques, transanal surgery, other sphincter sparing procedures and APR remain the mainstay of treatment for rectal cancer with almost the complete elimination of the Hartmann's operation for this condition. However Hartmann's procedure has persisted as a treatment option in perforated diverticular disease.

The hypothesis

The place of Hartmann's operation in management of colorectal cancer needs re-evaluation. In spite of obvious limitations, the Hartmann's procedure is still used from time to time in colorectal cancer surgery. However, the length of distal rectum preserved is usually much longer than Hartmann originally described (flush at levator ani level) and is even often reversed [13].

Evaluation of the hypothesis

In 1907, Mayo described the 3-stage technique for perforated diverticulitis in a 5 case series, the first documentation of a surgical treatment for diverticular disease [14,15,16]. In support of this, Judd and Pollock concluded that the safest surgical intervention was the 3-stage procedure: colostomy with distal irrigation, delayed resection and late colostomy closure [15]. It subsequently became the standard of care. However, because the 3-stage operation initially leaves the diseased colon behind, many people advocated resection of the diseased segment at the initial procedure and so it was abbreviated into the 2

stage Hartmann's operation [16].

Henri Hartmann never planned stoma reversal; he succeeded in his aim to resect the tumour with a reduced mortality (relative to APR). Because Allen Boyden noted that a conservative surgical approach resulted in significant morbidity he recommended resection as the treatment of choice [17]. Although the Hartmann's procedure was almost abandoned for colorectal cancer, in 1962, Staunton advocated its possible use in diverticular disease when a Mikulicz procedure is not possible [18].

In 1973, Labow et al proposed that Hartmann's operation can be done for sigmoid diverticulitis with obstruction or abscess, whether or not the patient was peritonitic, stating that it would offer many advantages and few disadvantages to these patients [19]. In 1979, Nunes advocated for the procedure after a series of 25 patients for whom it was done as treatment for diverticular disease. They concluded that their 8 % mortality, relatively short hospital stay, initial removal of the source of infection and avoidance of primary anastomosis made the technique a reasonable option in these patients [20]. Krukowski stated in 1984 that a Hartmann's should be done in most cases [21]. While in 1988, Schein reported a 6.6 % mortality and a restoration rate of 76.6 % [22]. In 1998, Desai et al reviewed 185 patients in whom a Hartmann's operation was done with 9 % morbidity and a 14 % mortality rate with reversal of stoma in 57 % of patients all of whom survived the second operation; they concluded that the procedure was safe [23].

These attitudes towards the Hartmann's operation contributed to the publication of the guidelines by the American Society of Colon and Rectal Surgeons (ASCRS), in 2000, that advocated for the procedure as the optimal management for perforated diverticular disease [24].

In 2006, however, the ASCRS revised its guidelines to be more patient specific, encouraging conservative approaches for the management of diverticulitis [25]. Subsequent to this, the 2014 update to the ASCRS guideline further encouraged decision making based on the individual cases but highlighted that patients with Hartmann's operations were less likely to have stoma reversal than those with resection, primary anastomosis and proximal diversion; thus, primary resection and anastomosis was recommended in preference to Hartmann's procedure [26]. The 2020 ASCRS guideline highlighted that most patients with diverticulitis will respond to non-surgical treatments. In the 15–32 % who need emergency surgery, the guideline notes the abundance of data showing improved mortality and morbidity rates with resection and primary anastomosis with or without a stoma. While a Hartmann's operation can be done in select patients, most patients report a poorer quality of life due to the end colostomy [27].

Consequences of the hypothesis and discussion

The Hartmann's operation initially served an important purpose, decreasing mortality for patients who had colorectal cancer surgery. The high death rate of APR required an alternative and the Hartmann's filled that need. However, with modern surgical advances, the APR slowly resumed popularity and is now often the surgery of choice for very low rectal cancers.

The evolution of the Hartmann's operation as the preferred procedure in perforated sigmoid diverticulitis began an era that saw a decreased mortality but increased morbidity of an often permanent stoma.

The Hartmann's procedure was endorsed through the 1980s to the 2000s. Now that primary resection and anastomosis is the preferred technique, Hartmann's operation has declined in popularity and is often not recommended for treating perforated diverticulitis. One hundred years later, Hartmann's procedure for colorectal cancer has little place in the management of patients with malignant or benign disease. In 2021, it is neither the standard of care for malignancy nor diverticular peritonitis and its limited place in colorectal surgery should be defined.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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