

Primary Anastomosis vs Hartmann Procedure in Acute Complicated Diverticulitis. Evolution over the Last Twenty Years

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Rezumat

Anastomoza primară versus procedura Hartmann în diverticulita acută complicată. Evoluția în ultimii 20 de ani

Scopurile lucrării: Scopul acestei lucrări este evaluarea rolului și indicațiilor sigmoidectomiei primare cu anastomoză directă pentru diverticulită, comparativ cu procedura Hartmann.

Material și Metodă: A fost revizuită literatura de specialitate folosind MEDLINE (PubMed), Google Scholar și Biblioteca Cochrane și au fost analizate articolele din ianuarie 1990 până în iunie 2011. Toți pacienții au fost divizați în 3 grupuri: anastomoză primară (PA), anastomoză primară cu stomă de protecție (SP) și procedură Hartmann (HP). Au fost luate în considerare: numărul de pacienți, mortalitatea și morbiditatea globală, rata de fistulizare, rata de repunere în tranzit după SP (RSP) și după HP (RHP) și clasificarea Hinchey.

Rezultate: Mortalitatea a fost de 38/1010 pacienți (3,8%) pentru PA, 11/153 pacienți (7,2%) pentru SP și 139/800 pacienți (17,4%) pentru HP. Morbiditatea a fost raportată la 103/325 pacienți (31,7%) în PA, la 23/97 pacienți (23,7%) în SP și la 290/586 pacienți (49,5%) în HP. Fistulele au fost înregistrate la

35/625 pacienți (5,6%) pentru PA, la 10/149 (6,7%) pentru RSP și la 11/426 pacienți (2,6%) pentru RHP. Continuitatea intestinală a fost restabilită la 82/628 pacienți cu SP (13,1%) și la 315/581 pacienți cu HP (54,2%) au fost clasificați în clasa I-II Hinchey și un număr total de 659 pacienți (45,5%) au fost clasificați în clasa III-IV Hinchey.

Concluzii: PA are o mortalitate și o morbiditate mai redusă față de HP și cu excepția unor indicații limitate, ar trebui să fie utilizată ca primă intenție de tratament în caz de diverticulită.

Cuvinte cheie: anastomoză primară, procedura Hartmann, diverticulită

Abstract

Background/Aims: Aim of this review is to assess the role and indications for primary sigmoidectomy with direct anastomosis for diverticulitis comparing it with the Hartmann's procedures.

Methods: A literature search was performed using MEDLINE (PubMed), Google Scholar and The Cochrane Library and the articles from January 1990 until June 2011 were analyzed. All patients were divided into three groups: primary anastomosis (PA), primary anastomosis and stoma protection (SP) and Hartmann's procedure (HP). Number of patients, overall mortality and morbidity, the rate of fistulization, the rate of reversal after SP (RSP) and after HP (RHP) and the Hinchey classification have been considered.

Results: The mortality was of 38/1010 patients (3.8%) for PA, 11/153 patients (7.2%) for SP and 139/800 patients (17.4%) for HP. The morbidity was reported in 103/325 patients (31.7%) in PA, in 23/97 patients (23.7%) in SP and in

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290/586 patients (49.5%) in HP. Fistula formation was recorded in 35/625 patients (5.6%) for PA, in 10/149 patients (16.4%) for RSP and 11/426 patients (6.4%) for RHP. The intestinal continuity was restored in 82/628 patients (56.9%) who underwent SP and in 315/581 patients (54.2%) undergoing HP. A total of 790 patients (54.5%) were classified in class I-II Hinchey and total of 659 patients (45.5%) was classified in class III-IV Hinchey.

Conclusion: The PA has a lower morbidity and mortality in relation to the HP and except some limited indications, should be used as treatment of choice in the case of diverticulitis.

Key works: primary anastomosis, Hartmann procedure, diverticulitis disease

Introduction

Sigmoid diverticulitis is a common disease of the Western World and results in a significant number of hospital admissions (1), with considerable societal costs due to loss of productivity (2). This disease affected one third of the population older than 45 years of the age and up two thirds of the population older than 85 years of age (3), while 10%-20% of the patients with diverticulosis will develop diverticulitis almost exclusively in the sigmoid colon (4).

In 1978, before the routine use of CT, Hinchey et al. (5) published a classification to assess the grade of perforated diverticular disease. This classification is based on the intraoperative description of peritoneal inflammatory situation and therefore does not assess the cases of diverticulitis of the sigmoid colon treated with antibiotics. To date, despite the

changes that followed it [Sher (6), Kohler (7), Wasvary (8) Kaiser (9)] remains the most common intraoperative classification (2) (Table 1).

For the treatment of acute complications of diverticular disease different surgical options have been used, including deviation of the faecal stream by a stoma without resection of the diseased segment (three stage procedure); resection, no anastomosis, temporary end-colostomy and oversewing of the rectal stump (Hartmann procedure); and resection with primary anastomosis, with or without a defunctioning stoma (one-stage procedure)(10). Recently laparoscopic treatment for diverticular disease have been reported (11).

During the last decades, the "gold standard" has changed, primary resection has become the standard practice, but fear of anastomotic leakage often deterred many surgeons from performing primary anastomosis (12).

Aim of this review is to assess the role and indications for primary sigmoidectomy with direct anastomosis for diverticulitis.

Material and Methods

A literature search was performed using MEDLINE (PubMed), Google Scholar and The Cochrane Library, and the articles from January 1990 until June 2011, edited in Italian, English and French, prospective or retrospective, were analyzed.

The keywords used were: "Hartmann's procedures," "Primary anastomosis", "secondary anastomosis", sigmoid colon resection ", " perforated diverticulitis ", " Hinchey classification "and" perforated diverticulitis. " These keywords were added alone or in combination by using Boolean operator "AND". All clinical case report were eliminated from the search.

Table 1. Hinchey classification and its modifications

	Original Hinchey classification	Sher (6), Kohler (7) modification	Wavary (8) modification	Keiser (9) modification
Stage I	Pericolic abscess confined by the mesentery of the colon	Pericolic abscess	Ia phlegmon Ib pericolic abscess	Ia confined pericolic inflammation-phlemon Ib confined pericolic abscess
Stage II	Pelvic abscess resulting from a local perforation of a pericolic abscess	IIA Distal abscess amenable to percutaneous drainage IIB complex abscess associated with/without fistula	Pelvic abscess	Pelvic, distant intrabdominal or retroperitoneal abscess
Stage III	Generalized peritonitis resulting from rupture of pericolic/pelvic abscess into the general peritoneal cavity	Generalized purulent peritonitis	Purulent peritonitis	Generalized purulent peritonitis
Stage IV	Fecal peritonitis results from the free perforation of a diverticulum	Fecal peritonitis	Fecal peritonitis	Fecal peritonitis

Only patients with diverticulitis disease were considered for the review. The patients treated for stenosis or cancer were deleted.

Analysis of the abstract is followed by the study of all articles that reported data on patients suffering from diverticulitis of the colon treated with surgical technique. These patients were divided into three groups: one group treated with one stage sigmoid resection and primary anastomosis (PA), a group treated with sigmoid resection, primary anastomosis and stoma protection (SP) and a third group treated with sigmoid resection and Hartmann's procedure (HP).

For each item were considered: the total number of patients, overall mortality and morbidity, the rate of fistulization, the rate of reversal after SP (RSP) and after HP (RHP) and the Hinchey classification. Finally we studied, for each procedure mortality and morbidity related to the Hinchey's class.

Results

At the end of the search, only 18 articles were found meeting the criteria of inclusion and they are used for the present study (4,10,13-28). A total of 1963 patients were analyzed.

The PA were performed in 1010 patients (51.5%), the SP were performed in 153 patients (7.8%) and the HP were performed in 800 patients (40.7%).

The mortality has been reported in all 18 articles. It was of 38/1010 patients (3.8%) in the case of PA, 11/153 patients (7.2%) in the case of SP and 139/800 patients (17.4%) in the case of HP. (Table 2)

The morbidity has been reported only in 12 articles for a total 1008 patients; it was reported in 103/325 patients (31.7%)

in PA, in 23/97 patients (23.7%) in SP and in 290/586 patients (49.5%) in HP (Table 3).

The number of patients who developed a fistula was recorded only in 12 articles for a total of 1200 patients. It occurred in 35/625 patients (5.6%) of the PA group, in 10/149 patients (6.4%) of the RSP group and 11/426 patients (6.4%) in group RHP (Table 4).

The number of patients who underwent restoration of intestinal continuity was reported in 13 articles for a total of 1353 patients. The intestinal continuity was restored in 82/628 patients (56.9%) underwent SP, after a period variable between 2 and 35 weeks and in 315/581 patients (54.2%) undergoing HP after a period variable between 6 and 8 weeks (Table 5).

The Hinchey classification was reported in 14 articles for a total of 1449 patients. The PA was performed in 656 patients (45.3%), the SP was performed in 149 patients (10.3%) and the HP was performed in 644 patients (44.4%). A total of 790 patients (54.5%) was classified in class I-II Hinchey. Of these 502 patients (63.5%) were submitted to PA, 83 patients (10.5%) were submitted to IP and 205 patients (26.0%) to PH. A total of 659 patients (45.5%) was classified in class III-IV Hinchey. Of these 154 patients (23.4%) were submitted to PA, 66 patients (10.0%) were submitted to SP and 439 patients (66.6%) were submitted to HP (Table 6).

In 10 articles the mortality and the related Hinchey class were reported for a total of 991 patients. The PA was performed in 535 patients (54.0%), the SP was performed in 129 patients (13.0%) and the HP was performed in 327 patients (33.0%). A total of 97/991 have been reported as mortality: 10 patients (1.0%) of these were in class I-II Hinchey and 87 patients (8.8%) in class III-IV Hinchey. The deaths in Hinchey class I-II were 2 patients (0.4%) in PA group, 0 patients (0%) in the SP group and 8 patients (2.4%) in the HP group. Deaths in

Table 2. Mortality

Author	Year	N° Pt	Surgical procedure			Mortality		
			PA	SP	HP	PA	SP	HP
People (13)	1990	349	276		73	11		25
Hold (14)	1990	175	70	29	76	2	2	9
Binda (15)	1993	39	21		18	2		6
Saccomani (16)	1993	29	14	7	8		1	3
Kriwanek (17)	1994	59	22	4	33	3	1	5
Belmonte (18)	1996	227	183	17	27	2		1
Wedell (19)	1997	214	148	35	31	1	1	7
Schilling (20)	2001	55	13		42	1		5
Maggard (21)	2001	74	42		32			2
Gooszen (10)	2001	60		32	28		6	5
Capasso (22)	2002	32	14		18			1
Bezzi (23)	2002	52	34	16	2	2		1
Blair (4)	2002	96	28	5	63	3		13
Makela (24)	2002	120	45		75	2		10
Regenet (25)	2003	60	27		33	3		4
Richter (26)	2006	41	33	3	5	4		3
Tabbada (27)	2010	194	18		176			12
Trenti (28)	2011	87	22	5	60	2		27
		1963	1010	153	800	38	11	139
			(51.5%)	(7.8%)	(40.7%)	(3.8%)	(7.2%)	(17.4%)

Legend: PA: Primary Anastomosis; SP: Stoma Protection; HP: Hartmann's Procedure

Table 3. *Morbidity*

Author	Year	N° Pt	Surgical procedure			Morbidity		
			PA	SP	HP	PA	SP	HP
Hold (14)	1990	175	70	29	76	11	11	16
Binda (15)	1993	39	21		18	6		8
Saccomani (16)	1993	29	14	7	8	8		2
Schilling (20)	2001	55	13		42	6		14
Gooszen (10)	2001	60		32	28		12	25
Bezzi (23)	2002	52	34	16	2	12		
Blair (4)	2002	96	28	5	63	8		18
Makela (24)	2002	120	45		75	16		24
Regenet (25)	2003	60	27		33	16		37
Richter (26)	2006	41	33	3	5	4		3
Tabbada (27)	2010	194	18		176	3		91
Trenti (28)	2011	87	22	5	60	13		52
		1008	325	97	586	103	23	290
			(32.2%)	(9.6%)	(58.2%)	(31.7%)	(23.7%)	(49.5%)

Legend: PA: Primary Anastomosis; SP: Stoma Protection; HP: Hartmann's Procedure

Table 4. *Fistulization*

Author	Year	N° Pt	Surgical procedure			Fistulization		
			PA	SP	HP	PA	RSP	RHP
Hold (14)	1990	175	70	29	76	7	7	4
Binda (15)	1993	39	21		18	1		
Saccomani (16)	1993	29	14	7	8	2		1
Belmonte (18)	1996	227	183	17	27	3		1
Wedell (19)	1997	214	148	35	31	1		
Gooszen (10)	2001	60		32	28		3	3
Bezzi (23)	2002	52	34	16	2	9		
Blair (4)	2002	96	28	5	63	1		
Makela (24)	2002	120	45		75	4		
Regenet (25)	2003	60	27		33	3		2
Richter (26)	2006	41	33	3	5	1		
Trenti (28)	2011	87	22	5	60	3		
		1200	625	149	426	35	10	11
			(52.1%)	(12.4%)	(35.5%)	(5.6%)	(16.4%)	(6.4%)

Legend: PA: Primary Anastomosis; SP: Stoma Protection; HP: Hartmann's Procedure; RSP: Reversal after Stoma Protection; RHP: Reversal after Hartmann's Procedure

Table 5. *Intestinal continuity*

Author	Year	N° Pt	Surgical procedure			Intestinal continuity		
			PA	SP	HP	PA	RSP	RHP
Hold (14)	1990	175	70	29	76		15	47
Binda (15)	1993	39	21		18			2
Saccomani (16)	1993	29	14	7	8		8	3
Belmonte (18)	1996	227	183	17	27			19
Wedell (19)	1997	214	148	35	31		31	9
Schilling (20)	2001	55	13		42			32
Gooszen (10)	2001	60		32	28		24	13
Bezzi (23)	2002	52	34	16	2			1
Makela (24)	2002	120	45		75			35
Regenet (25)	2003	60	27		33			29
Richter (26)	2006	41	33	3	5			1
Tabbada (27)	2010	194	18		176			105
Trenti (28)	2011	87	22	5	60		4	19
		1353	628	144	581		82	315
			(46.4%)	(10.7%)	(42.9%)		(56.9%)	(54.2%)

Legend: PA: Primary Anastomosis; SP: Stoma Protection; HP: Hartmann's Procedure; RSP: Reversal after Stoma Protection; RHP: Reversal after Hartmann's Procedure

Table 6. *Hinchey Class*

Author	Year	N° Pt	Surgical procedure			Hinchey's class I-II			Hinchey's class III-IV		
			PA	SP	HP	PA	SP	HP	PA	SP	HP
Hold (14)	1990	175	70	29	76	59	24	45	11	5	31
Binda (15)	1993	39	21		18	12		1	9		17
Saccomani (16)	1993	29	14	7	8	8	2	1	6	5	7
Belmonte (18)	1996	227	183	17	27	167	5	5	16	12	22
Wedell (19)	1997	214	148	35	31	138	31	16	10	4	15
Schilling (20)	2001	55	13		42				13		42
Gooszen (10)	2001	60		32	28		11	9		21	19
Bezzi (23)	2002	52	34	16	2	34	10			6	2
Blair (4)	2002	96	28	5	63	24		31	4	5	32
Makela (24)	2002	120	45		75	44		28	1		47
Regenet (25)	2003	60	27		33				27		33
Richter (26)	2006	41	33	3	5				33	3	5
Tabbada (27)	2010	194	18		176	16		69	2		107
Trenti (28)	2011	87	22	5	60				22	5	60
		1449	656	149	644	502	83	205	154	66	439
			(45.3%)	(10.3%)	(44.4%)	(63.5%)	(10.5%)	(26.3%)	(23.4%)	(10.0%)	(66.6%)

Legend: PA: Primary Anastomosis; SP: Stoma Protection; HP: Hartmann's Procedure

Table 7. *Mortality in Hinchey's classes*

Author	Year	N° Pt	Surgical procedure			Hinchey's class I-II			Hinchey's class III-IV		
			PA	SP	HP	PA	SP	HP	PA	SP	HP
Hold (14)	1990	175	70	29	76	1		3	1	2	6
Binda (15)	1993	39	21	0	18				2		6
Saccomani (16)	1993	33	18	8	7				3	1	
Belmonte (18)	1996	227	183	17	27				2		1
Wedell (19)	1997	214	148	35	31	1		3		1	4
Schilling (20)	2001	55	13	0	42				1		5
Gooszen (10)	2001	60	0	32	28			2		5	4
Regenet (25)	2003	60	27		33				3		4
Richter (26)	2006	41	33	3	5				4		3
Trenti (28)	2011	87	22	5	60				2		27
		991	535	129	327	2		8	18	9	60
			(54.0%)	(13.0%)	(33.0%)	(0.4%)		(2.4%)	(3.4%)	(7.0%)	(18.3%)

Legend: PA: Primary Anastomosis; SP: Stoma Protection; HP: Hartmann's Procedure

Hinchey class III-IV were 18 patients (3.4%) in the PA group, 9 patients (7%) in the SP and 60 patients (18.3%) in the HP group (Table 7).

In only 5 articles morbidity and related class of Hinchey were reported for a total 370 patients. The PA were performed in 164 patients (44.3%), the SP were performed in 32 patients (8.7%) and the HP were performed in 174 patients (47.0%). Of these 132/370 patients (35.7%) have been reported with complications: of these 27 patients (7.3%) were in class I-II Hinchey and 105 patients (28.4%) in class III-IV Hinchey. The morbidity in class I-II Hinchey was 13 patients (7.9%) in PA group, 9 patients (28.1%) in the SP group and 5 patients (2.8%) in the HP group. The morbidity in Hinchey class III-IV were 38 patients (23.1%) in the PA group, 2 patients (6.2%) in the SP and 65 patients (37.3%) in the HP group (Table 8).

Discussion

For several years the traditional teaching has been that elective sigmoidectomy was warranted after 2 attack of

uncomplicated diverticulitis (2). With the limitation of a retrospective study based on administrative data, Stocchi et al, with a large number of patients confirms that a less aggressive strategy for elective surgery did not result in any worrisome increase in the rate of presentation with diffuse peritonitis from diverticular perforation (2). Contemporary proponents of surgery after 2 attacks argue that earlier surgery favorably impacts patient symptoms (29).

In case of complicated diverticular disease the indications for elective or semielective surgery include: 1) patients with two or more previous acute attacks who were treated conservatively; 2) patients with one attack that is to be associated either with a contained perforation, or colonic obstruction, or with a fistula; 3) patients with suspicious colonic carcinoma that cannot be excluded; 4) patients with less than 50 years of age with a single attack requiring hospitalization, may be treated surgically because this young patient group has longer life expectancy which does increase the possibility and the risk of subsequent episodes and related complications (30).

Table 8. Morbidity in Hinchey's Classes

Author	Year	N° Pt	Surgical procedure			Hinchey's class I-II			Hinchey's class III-IV		
			PA	SP	HP	PA	SP	HP	PA	SP	HP
Hold (14)	1990	175	70	29	76	10	9	5	1	2	11
Binda (15)	1993	39	21		18	3			3		8
Schilling (20)	2001	55	13		42				6		14
Regenet (25)	2003	60	27		33				24		29
Richter (26)	2006	41	33	3	5				4		3
		370	164	32	174	13	9	5	38	2	65
			(44.3%)	(8.7%)	(47.0%)	(7.9%)	(28.1%)	(2.8%)	(23.1%)	(6.2%)	(37.3%)

Legend: PA: Primary Anastomosis; SP: Stoma Protection; HP: Hartmann's Procedure

Analysis of the data shows that despite the literature consider the PA safe and effective for the surgical treatment of diverticular disease (15), many authors still prefer to perform HP and in case of PA almost 8% performed an SP. The higher mortality and morbidity in the group of HP is explained by the fact that the majority of patients in which the PA is made belongs to the class I-II Hinchey, while patients with HP are in III-IV to Hinchey. A meta-analysis of 5 articles showed that the PA has a lower rate of septic complications than the HP. The same study showed no increased rate of anastomotic dehiscence in PA compared to the RHP (31).

One of the complications that lead to run a PH is the risk of developing a fistula postoperatively, which may require another operation. In literature the fistulization rate after HP for complicated diverticular disease was 5.6% on average [ranges from 5% (32) to 20% (33)]. One of the benefits of patients treated with PA after sigmoidectomy for diverticulitis consists in avoid a second operation to restore intestinal continuity, and prevent complications related to a second intervention (34). Moreover the rate of fistulization after recanalization for HP exceeds 25% (1). Analyzing the data we collected, the percentage of fistulization after PA is 5.6%. If the anastomosis is protected with the SP, the rate of fistulization after RSP is 6.7%. The fistulization rate depends not only on intraoperative factors, as a adequate blood supply to the stumps (33) or the absence of tension between the two stumps (33), but also of the patient's age, the comorbidity, the disease severity and the degree of peritonitis and inflammation that plays a major role (35). Also, when the anastomosis is performed by a surgeon with adequate experience, the risk of fistula is reduced also in the presence of generalized peritonitis (36). Finally primary anastomosis in the presence of peritonitis and without bowel preparation is an emotional topic that divides surgeons. Blair et al. supports the use of primary resection and anastomosis without bowel preparation in patients undergoing surgery for acute perforated diverticular disease (4).

Our analysis shows that the HP is even the technique more used in case of diverticular perforation of the sigmoid in class of Hinchey III or IV despite the high rates of mortality and morbidity. Instead the HP should be reserved only for patients with hemodynamic instability or with high risks factors as patients with immunosuppressant, chronic renal failure, liver cirrhosis, with previous organ trasplantation or complex

cardiovascular reconstructive procedures that have a significant increased risk of dying after sigmoid resection for perforated diverticulitis (26).

The RHP can be difficult in more than 1/3 of patients and therefore the colostomy represents the definitive treatment until 40% of cases in which HP was performed (27), but it in these patients worse significantly quality of life (25). In our review intestinal restoration was performed only in about half of the patients. One of the reason of this failure is the technical difficulties due to the adhesions. Moreover many patients are elderly, with multiple risk factors, that definitively contraindicate a second step surgery (23). In case of RSP the rate of closure of stomia goes from 4.6% to 40.0% with at average of 56.9%. The high percentage of intestinal restoration for SP procedure in relation to the HP is due to the minimal access, absence of laparotomy and the possibility to perform the procedure in local anesthesia with minimal risk for the compromised patients. Closure of the stoma in the second stage is usually a so-called "local" procedure without relaparotomy and much easier than anastomosis after a Hartmann procedure (10).

For patients in class Hinchey I-II, laparoscopic approach is not the first choice, but it may be justified without gross abnormalities (37). For Hinchey III-IV, laparoscopic approach is not considered in the literature.

The high percentage of PA in class of Hinchey I-II and the high percentage of HP in class di Hinchey III-IV is probably due to the fact that the treatment of acute diverticulitis is mainly carried out in emergency setting and not all surgeons especially the youngest have the expertise to perform a PA. Moreover HP is erroneously considered as more safe procedure in relation to the PA. But consequently to the present study for the minor morbidity and mortality PA should be ever considered except in very limited high risk patients (26).

In conclusion, the PA has a lower morbidity and mortality in relation to the HP. Although many believe that in cases of PA, the patient is subject to a higher risk of fistula, there is no data in the literature in favor of this hypothesis. Only half of the patients may be restored after HP because of their general conditions. Therefore, PA avoids a second operation especially in patients with poor general condition. In addition this procedure reduces healthcare costs, and improves the quality of life of these patients.

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