

*Case Analysis*

## A Comparison between Hartmann's Procedure and Primary Anastomosis with Defunctioning Stoma in Complicated Left-Sided Colonic Perforation

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### **Key Words**

Complicated colonic diverticulitis;  
Stercoral ulcer perforation;  
Hartmann's procedure;  
Defunctioning stoma

**Purpose.** Left-sided complicated colon diverticulitis or stercoral ulcer perforation is a life-threatening condition. Based on patients' condition and surgeons' preference, surgeons can choose to perform a variety of operative methods to save patients' lives. We perform a retrospective chart review, at our hospital, to compare patients receiving Hartmann's procedure and patients receiving primary anastomosis with defunctioning stoma.

**Methods.** A total of 35 patients are analyzed. Patient demographics, peri-operative data, operation time and total hospitalization days are compared.

**Results.** No statistical difference was noted over ASA score, shock status, total hospital stay, complication rate and mortality rate between two groups. However, there is a trend favoring the primary anastomosis with defunctioning stoma group to have shorter hospital stay and higher enterostomy takedown rate.

**Conclusion.** Under emergency circumstances, primary anastomosis with defunctioning stoma can be an alternative choice for patients in stable condition when we take operative morbidity/mortality, total hospitalization days and enterostomy takedown rate into consideration.

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**A**cute left-sided colonic perforation, including complicated diverticulitis (Hinchey stage III and IV) and stercoral ulcer perforation, is a true colorectal emergency and requires urgent surgical intervention to remove diseased bowel segment, irrigate peritoneal cavity, and either to divert stool stream or reconstruct bowel continuity. Usually under these circumstances, the hemodynamic conditions of patients are unstable so safety is always the major concern.<sup>1</sup> Due to high prevalence rate of diverticulitis in the western society,

the operation methods have been extensively studied. Three major categories of operation methods are often chosen, including Hartmann's procedure, primary bowel resection and anastomosis, and primary anastomosis with defunctioning stoma.<sup>2,5</sup>

Hartmann's procedure for complicated colonic diverticulitis and colonic perforation has long been considered as a safe and fast surgical technique or the "gold standard" procedure, since its invention in 1921 by Henri Albert Hartmann.<sup>7</sup> The procedure is suitable

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for unstable patients who cannot tolerate long-time anesthesia. The main goal of the procedure is to resect the obstruction or perforation site and pull out a diverting end colostomy as soon as possible. Therefore, the advantages of this procedure are two-faceted: first, the operation time can be quite short, a great benefit for patients with multiple comorbidities; second, there is no risk of anastomosis leakage. However, a significant number of patients (as high as 60%) who had received Hartmann's procedure are unable to receive Hartmann reversal due to a variety of reasons, including advanced age, severe comorbidities and technical difficulty.

In recent years, primary bowel resection with anastomosis is gaining more acceptance to avoid end-colostomy complications but there are still controversies.<sup>2-4</sup> Besides, literatures have shown that patients receiving primary anastomosis with defunctioning stoma can decrease anastomosis leakage rate and post-operative morbidity/mortality rate, compared to those receiving primary bowel resection and anastomosis or Hartmann's procedure.<sup>2</sup>

Thus, we conduct a survey to evaluate Hartmann's procedure and primary anastomosis with defunctioning stoma, and to examine the experiences of our hospital and to see which operative method is better for surgeons and patients.

## Patients and Methods

The retrospective case analysis, done at National Cheng Kung University Hospital, identified patients of acute left-sided colonic perforation (including complicated diverticulitis and stercoral ulcer perforation), who received emergency operations between April 1997 and December 2009. The analysis includes patient's age, lesion location, ASA scores, operation time, peri-operative status, complications, mortality, and enterostomy takedown rates. Post-operative mortality is defined as death within 30 days of surgery or by direct consequence of a post-operative complication. Complicated diverticulitis refers to Hinchey stage III (58.6%) and IV (41.4%) patients. Stercoral ulcer perforation almost always accompanies fecal peritonitis. In the end, a total of 35 patients were in-

cluded in this retrospective study. Two groups of patients (Hartmann's procedure group and primary anastomosis with defunctioning stoma group) were identified for comparison.

## Results

In this review, thirty-one out of 35 patients (88.6%) received Hartmann's procedure and four out of 35 patients (11.4%) received primary anastomosis with defunctioning stoma (either loop colostomy or loop ileostomy). The high percentage rate meant Hartmann's procedure still remained the most frequently chosen procedure when surgeons encountered an acute left-sided colonic diverticulitis or perforation. Six patients of stercoral ulcer perforation all received Hartmann's procedure due to fecal peritonitis. Almost all lesions were located at rectosigmoid region. When we made a comparison of the two groups, there was no significant difference over ASA score, total operation time, complication rate and mortality rate (Table 1). However, there was a trend favoring the primary anastomosis with defunctioning stoma group to have shorter operation time to takedown stoma, higher stoma takedown rate and shorter hospital stay (Table 2). Nine patients died from multiple organ failure over the group of Hartmann's resection and one patient died from bilateral pneumonia in the primary anastomosis with defunctioning stoma group, so they were unable to receive enterostomy takedown procedure. The wound infection and colostomy ischemia rate were higher in the group of Hartmann's resection. The first operation time was longer in primary anastomosis with defunctioning stoma group but the total operation time (adding up first and second operations) were comparable between the two groups (Table 2).

Up to sixty percent of patients in the group of Hartmann's resection ended up with permanent stoma. All the patients in the primary anastomosis with defunctioning stoma group received enterostomy takedown procedures. All of the takedown procedures were conducted 6 months after the first operation and no mortality was reported. Most of our patients were of severe systemic disturbance and received emergency operations (ASA scores stood at 3E or above).

**Table 1.** Patient demographics and peri-operative data

	Hartmann's procedure	PADS*	<i>p</i> -value
Male:Female	13:18	3:1	
Age	74.5 ± 10.8 (48-91)	68.8 ± 19.4 (40-82)	
Etiology			
Diverticulitis	25/31 (80.6%)	4/4 (100%)	
Stercoral ulcer perforation	6/31 (19.4%)	0/4	
ASA score			0.85
2E	4/31 (12.9%)	0/4	
3E	18/31 (58.1%)	3/4 (75%)	
4E	8/31 (25.8%)	1/4 (25%)	
5E	1/31 (3.2%)	0/4	
Shock during operation	13/31 (41.9%)	0/4	0.27
Operation time (min.)	191.3 ± 63.1 (112-303)	244.7 ± 104.5 (142-351)	0.38
Complications	18/31 (58.1%)	1/4 (25%)	0.31
Wound infection	8/31 (25.8%)	0/4	0.55
Pneumonia	4/31 (12.9%)	1/4 (25%)	0.48
Colostomy ischemia	4/31 (12.9%)	0/4	1.0
Prolonged ileus	2/31 (6.5%)	0/4	1.0
Mortality	9/31 (29%)	1/4 (25%)	1.0

\*PADS = Primary anastomosis with defunctioning stoma.

**Table 2.** Comparison between takedown rate, operation time and hospitalization days

	Reversal of Hartmann's procedure	Loop enterostomy takedown	<i>p</i> -value
Colostomy takedown rate*	9/22 (40.9%)	3/3 (100%)	0.11
Operation time (min.)	214 ± 62.6 (135-300)	118.7 ± 26.1 (89-138)	0.09
Total operation time**	405.3 ± 91.9 (256-535)	363.3 ± 129.1 (231-489)	0.71
Total hospital stay (day)***	33 ± 9.5	23.7 ± 4.2	0.12

\* Nine patients died in reversal of Hartmann's group and one patient died in PADS group before being able to receive takedown procedure.

\*\* Represents total operation time of Hartmann's procedure + reversal of Hartmann's procedure or PADS (primary anastomosis with defunctioning stoma) + loop enterostomy takedown procedure.

\*\*\* Represents total hospital stay of Hartmann's procedure + reversal of Hartmann's procedure or PADS (primary anastomosis with defunctioning stoma) + loop enterostomy takedown procedure.

## Discussion

Colonic diverticulitis is a common disease for patients over 60 years old in the western countries but is relatively few in our eastern societies. For complicated colonic diverticulitis (Hinchey stage III and IV), the experience obtained from the western countries gives us a solid base to decide the most suitable operative method.<sup>2</sup> Stercoral ulcer perforation (hard, impacted stool over sigmoid colon causing colonic ulceration and perforation) usually presents with fecal peritonitis and often requires the same decision-making process as when dealing with complicated colonic

diverticulitis. So, we put the two together into our study groups.

In our retrospective review, at the initial presentation of complicated colonic diverticulitis or stercoral ulcer perforation, Hartmann's procedure remains our treatment of choice in 12 years. Hartmann's procedure takes less time to perform compared to primary anastomosis with defunctioning stoma. However, there is more colostomy ischemia incidence for Hartmann's group and hence, higher revision rate (12.9%). Up to 59.1% of our patients in the Hartmann's group do not takedown their stoma, comparable to those in the literatures.<sup>2,3</sup> The ASA scores, morbidity and mortality

rate of our review are comparable to those of the reported literatures<sup>1-3</sup> as well.

To takedown the end colostomy requires a lot more time than to takedown the loop colostomy. Reversal of Hartmann's procedure can be quite challenging and technical difficulty usually is the major factor resulting in the long operation time.<sup>4</sup> It is because of a variety of reasons, including dense pelvic adhesion, pelvic irradiation or pelvic sepsis. In the literature ever reported, sometimes colostomy takedown attempts are abandoned during operations due to technical difficulty or rectal stump ischemia.<sup>6,7</sup> Another major factor is that patients' co-morbidities preclude the attempt to accept another operation requiring long hours. So, some patients would just be left with permanent stoma, not even trying to restore bowel continuity.

On the contrary, in our review, loop colostomy takedown procedure is a lot easier to perform, taking a lot less operation time and thus increasing surgeons' willingness to perform the takedown operation (loop colostomy takedown rate is 100% in all three patients with complicated diverticulitis). However, for patients with multiple comorbidities, the chance to receive another operation could be quite low, so surgeons tend to choose Hartmann's procedure to shorten the operation time at the initial presentation. So, a natural selection bias exists in this discussion. Besides, the patient numbers in our primary anastomosis with defunctioning stoma group are small, so 100% takedown rate cannot reach statistical significance.

According to world literatures,<sup>9,10</sup> restoration of bowel continuity after Hartmann's procedure is associated with anastomosis leakage as high as 4~16% and mortality rate as high as 4%. In our hospital, the takedown procedures are conducted 6 months after the first operation to minimize complications.<sup>8</sup> It is fortunate for us that no anastomotic leakage is noted for our patients receiving reversal of Hartmann operations. In our primary anastomosis with defunctioning stoma group, we think the protective stoma might play a helping role in it (stool diversion).

At last, we can identify, in our review, that as long as patients' condition can tolerate longer anesthesia time during initial presentations, the over-all operation time (including colostomy takedown) in both

groups can be quite comparable. Furthermore, the ease of loop-enterostomy takedown can also reduce surgeon's stress during operations, which is a great benefit to surgeons. Besides, there is a tendency of shorter hospital stay in the primary anastomosis with defunctioning stoma group. So basically, the results of primary anastomosis with defunctioning stoma are quite comparable, if not better, to Hartmann's procedure for patients under stable conditions.

## Conclusion

Hartmann's procedure still remains surgeon's preference when encountering acute left-sided complicated colonic diverticulitis or stercoral ulcer perforation. However, based on our review, we can advocate that, as long as patient's condition remains stable during emergency operation, primary anastomosis with defunctioning stoma can be an alternative choice when we take operative morbidity/mortality, total hospital stay and enterostomy takedown rate into consideration.

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## 病例分析

# 比較 Hartmann 術式和大腸切除併保護性腸道造瘻在左側複雜性大腸破裂的情況

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**目的** 左側複雜性大腸破裂 (包括複雜性大腸憩室炎及糞石導致大腸破裂) 是會威脅病人生命的腹部急症。基於病人臨床的生命徵象及外科醫師的偏好, 外科醫師可以選擇施行適當的手術來拯救病人的生命。為此, 我們進行院內的病歷回顧, 以比較病人在接受 Hartmann 術式及大腸切除併保護性腸道造瘻後, 兩組的差異。

**方法** 我們總共分析了 35 個病人。包括比較病人的疾病種類、手術前後的資料、手術時間及總住院天數。

**結果** 在麻醉分級、手術前後休克狀態、總手術時間、併發症及死亡率方面, 都沒有統計學上的意義。但在大腸切除併保護性腸道造瘻的這一組, 卻有總住院時間較短及有較高的腸道造瘻關閉手術比率的趨勢。

**結論** 在緊急手術下, 一旦我們把手術併發症、手術死亡率、總住院天數及腸道造瘻關閉手術比率, 大腸切除併保護性腸道造瘻對病人的好處和 Hartmann 術式是相當的。

**關鍵詞** 大腸憩室炎、大腸破裂、Hartmann 術式、保護性腸道造瘻。