Acute Mesenteric Ischemia: Still High Mortality Rate in the Era of 24-Hour Availability of Angiography

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Backgrounds: *Acute mesenteric ischemia (AMI) is a serious condition with high mortality rate due to difficult and late diagnosis. Early and aggressive evaluation in high risk patients by mesenteric angiography is the key to the reduction in mortality rate. However, many physicians hesitated to perform it because of its availability, the risk of complications and high negative results. This study reviewed outcome of AMI in term of mortality rate, factors associated with mortality and the rate of angiography in high risk patients.*
Material and Method: *The clinical data of the patients who were diagnosed as AMI were retrospectively reviewed. The clinical outcome was recorded and the factors associated with mortality were analysed.*
Results *: Thirty-five patients were enrolled into this study during 5 years. The mortality rate was 74.3%. There were 22 high risk patients for AMI. The rate of angiography performed in this group was 4.5% (1/22). The factors associated with mortality were age more than 60 years, patients with peritonitis, hypotension, arterial cause, time interval between admission and operation or treatment more than 24 hours, bowel gangrene > 100 cms. However all these factors were not statistically significant.*
Conclusion: *The mortality rate of AMI is still high even at the tertiary hospital where the angiography is available 24 hours. To decrease the mortality rate, the physicians must have the high index of suspicion in high risk patients and do not hesitate to perform early mesenteric angiography.*

Keywords: *Acute mesenteric ischemia, Mesenteric angiography*

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Acute mesenteric ischemia (AMI) is a life-threatening emergency with mortality rates still ranging between 59%-93% as shown in Table 1[1,2]. This continuing high mortality rate can be attributed mainly to three factors[3] : 1) inability to make the diagnosis before intestinal gangrene develops. 2) progression of the bowel infarction after the primary initiating vascular or systemic cause has been corrected, and 3) the increasing frequency of nonocclusive mesenteric ischemia. The easiest and practical strategy to correct these factors is to make the early and aggressive evaluation for acute mesenteric ischemia in high risk patients. Boley, et al[3], in the interesting and classic paper: " Initial results from an aggressive roentgenological and surgical approach to acute mesenteric ischemia" , in 1977 showed that the mortality rate was decreased to 46% with such approach. Based on this study, The American Gastroenterological Association

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Table 1. Mortality rates for AMI

Study (yr)	No.of patients	Mortality rate (%)
Clavien et al. (1987)	81	83
Kach and Largiader (1989)	45	60
Georgiev (1989)	175	93
Inderbitzi et al. (1992)	100	68
Cohen Solal et al. (1993)	30	67
Levy et al. (1990)	92	59
Mishima (1988)	162	65
Ritz et al. (1997)	141	71
Voltolini et al. (1996)	47	72
Zan et al. (1993)	32	72

Adaped from Brandt LJ, Boley SJ[1]

(AGA)[1] recommended that patients at risk who have abdominal pain severe enough to call to the attention of a physician and whose pain persists for more than 2 or 3 hours should be evaluated with mesenteric angiography. Patients at risk mean patients older than 50 years with congestive heart failure, cardiac arrhythmias, recent myocardial infarction, hypovolemia, hypotension, sepsis, a history of previous emboli, vasculitis, deep vein thromboses, hypercoagulable state or classic early finding of severe abdominal pain out of proportion to the physical findings. Although a decreased mortality rate has been demonstrated clearly in a number of reported series in which routine angiography has been used (Table 2), there still have been the opponents of routine angiography citing its nonavailability, difficulties and risks in performing angiography in critically ill patients which made the physician hesitate to request for it. The aim of this study was to reveal outcomes of AMI in term of mortality, factors associated with mortality and the rate of angiography performed in high risk patients during the 5-year period of study when angiography became available 24 hours at King Chulalongkorn Memorial Hospital (KCMH).

Material and Method

The medical records of the patients who were diagnosed as acute mesenteric ischemia at KCMH from January 1st, 2000 to January 31st, 2005 were reviewed retrospectively. There were altogether 35 patients. The patients were divided into 2 groups according to the etiology : arterial and venous groups. The demographic data, underlying disease, rate of angiography in high risk patient according to the AGA recommendation as previously described, the clinical findings, time interval between admission and operation or treatment, operative findings, mortality rate were collected. The factors that might be associated with mortality were also analysed.

Statistical analysis

The clinical data such as age, blood pressure, BUN, and creatinine were shown in the median value. The association between mortality rate and risk factors were assessed univariately with chi-square test or Fisher exact test. P-value < 0.05 was determined as statistically significant.

Results

The patient characteristics were listed in Table 3. There were 27 patients (77.17%) in arterial group and 8 patients (22.9%) in venous group. The median age were 68 and 70 years in arterial and venous groups, respectively.

Clinical findings and investigations

All patients presented with abdominal pain or unexplained abdominal distension. Thirty patients (85.7%) were older than 50 years. In this group, 22 patients (62.9%) had risk factors according to AGA. However, only 1 patient (4.5%) was evaluated with mesenteric angiography. This patient, 61 year-old female, developed unexplained abdominal distension after aneurysmorrhaphy for abdominal aortic aneurysm. After conservative treatment for a few days, her condition did not improve. The CT-angiography was done and revealed no occlusion of mesenteric vessels. She still had abdominal distension, eventually the mesen-

Table 3. The characteristics of AMI patients at KCMH during January 1st, 2000 – January 31st 2005

	Arterial group	Venous group
Sex Male	13	3
Female	14	5
Age (median)	68 (range 25-92 years)	70 (range 39-85 years)
Underlying disease		
DM	10	2
Hypertension	8	2
Heart disease	15	3
Digitalis usage	5	2
Autoimmune disorder	2	2
On vasopressive drug	8	
CVA/peripheral vascular dis.	5	
Aortic Aneurysm	3	

Table 2. Studies in which mesenteric angiography was used routinely in diagnosis and management of AMI

Study (yr)	No.of patients	Positive (%)	Sensitivity (%)	Specificity (%)	Mortality (%)
Boley et al.[3] (1977)	50	70	94	100	46
Kaufman et al.[7] (1977)	11	100	100	-	18
Clark and Gallant [6] (1984)	56	48	100	100	52
Boos [5] (1992)	62	95	100	-	53

teric angiography was performed and showed thrombosis of superior mesenteric artery (SMA). Surgical intervention was required due to peritonitis. Small bowel resection and end to end anastomosis was performed for gangrenous jejunum,170 cms in length. Unfortunately, she developed leakage of anastomosis, uncontrolled sepsis and finally expired.

The other clinical findings and the factors that might be the contraindication to angiography were shown in Table 4.

Operative findings and management

Thirty-three patients were treated by surgical intervention. The extensive bowel ischemia incompatible with life was found in 8 patients (24.2%). The operative findings and management were shown in Table 5. The other 2 patients with mesenteric vein thrombosis (MVT) were treated successfully by anticoagulant.

Mortality

The mortality rate was 74.3% (27/35) and the factors that might be associated with the mortality were shown in Table 6.

Discussion

This study showed that the mortality rate remained high (74.3%) even at the tertiary hospital where the angiography could be performed at all hours. From our data, 80% of patients had peritonitis before operation, only 28.6% of patients received treatment or operation within 24 hours after admission, 91.4% of patients had bowel gangrene, and 23% of patients had extensive bowel ischemia which was incompatible with life. These findings indicated that the diagnosis of AMI was not made early enough. Twenty two of 35 patients

Table 4. The clinical findings and investigations in AMI patients

-Age > 50 years	30/35 (85.7%)
-Patients with risk factors according to AGA	22/35 (62.9%)
-The rate of mesenteric angiography performed in high risk patients	1/22 (4.5%)
-Blood pressure (median)	
- Systolic	135 (range 0-185 mmHg)
- Diastolic	65 (range 0-135 mmHg)
-BUN (median)	33 mg%
-Creatinine (median)	1.6 mg%
-Clinical peritonitis	28/35 (80%)
-Time interval between admission and operation or Treatment	
- ≤ 24 hours	10 (28.6%)
- > 24 hours	25 (71.4%)

Table 5. The operative findings and management in AMI patients

Operative finding	Number
- NO BOWEL GANGRENE	
Arterial group	1/27 (3.7%)
Venous group	2/8 (25%)
- BOWEL GANGRENE <100cm	
Arterial group	7/27 (25.9%)
Venous group	5/8 (62.5%)
- BOWEL GANGRENE >100cm	
Arterial group	19/27 (70.4%)
Venous group	1/8 (12.5%)
Operative management	Number
- Exploratory laparotomy with em bolectomy	1/35 (2.8%)
- Exploratory laparotomy with bowel resection	24/35 (68.6%)
- Unresectable	8/35 (23.0%)
- Non-operative management	2/35 (5.6%)

Table 6. The mortality rate and associated factors in AMI patients

Factor	Number	Death	Percentage	p-value*
Age				
< 60 years	11	7	63.6	0.226
≥ 60 years	24	20	83.3	
Peritonitis				
Yes	28	23	82.1	0.312
No	7	4	57.1	
BP < 90/60 mmHg				
Yes	9	9	100.0	0.081
No	26	18	69.2	
Etiology				
Arterial	27	22	77.8	0.346
Venous	8	5	62.5	
Time interval between admission and operation or treatment				
≤ 24 hrs	10	6	60	0.186
> 24 hrs	25	21	96	
Bowel gangrene				
No gangrene	1	-	-	0.229
Gangrene ≤ 100 cm	12	9	75	1.000
Gangrene > 100 cm	20	18	85	0.246
Overall mortality	35	27	74.3	-

* p value significant < .05

(62.9%) should have been aggressively evaluated with mesenteric angiography according to AGA recommendation but only 1 (4.5%) patient had the investigation. Most patients had no contraindication to angiography : median systolic and diastolic blood pressure = 130/65 mmHg, median creatinine level = 1.6 mg%. The probable reason for low rate of mesenteric angiography in these high risk patients was the low index of suspicion and the hesitation of the physicians to request it. They were afraid of its complications and unduly concerned with the high rate of negative results reported in the literature[1]. In the study of Boley, et al[3], there was 30% negative results in high risk patients and 3/50 patients had transient acute tubular necrosis following angiography. Many studies which routine angiography had been used reported the obviously decreased mortality rate (Table 2). Many physicians feel that the high rate of negative results and risk of complications are acceptable if diagnoses are to be made early enough to improve survival[1]. However, prompt exploratory laparotomy should be performed in patients with suspected AMI in whom expeditious angiography is not available.

Mesenteric angiography is not only an important tool for early diagnosis in AMI but it also has other benefits. It can be used as the route of papaverine infusion for correction of nonoccluded segment vasoconstriction. In some patients, thrombolytic agents can be also infused by this route as a definitive treatment[4]. At operation, mesenteric angiography is helpful as the road map for revascularization.

Park, et al[8], studied the factors associated with survival in 58 patients and found that the older patients (>60 years), those who did not undergo bowel resection, and those with nonocclusive mesenteric ischemia (NOMI) have the highest mortality rates. Schoots, et al[9], in an analysis of data from 45 observational studies containing 3692 patients with AMI showed that the operative mortality rate for superior mesenteric arterial embolism (SMAE) and MVT was less than that for superior mesenteric arterial thrombosis (SMAT) and NOMI. Inderbitzi, et al, also reported the higher mortality rates if time interval between the beginning of symptoms and operation was more than 24 hours compared with that was less than 24 hours (87.5% vs. 58.3%)[2]. In our study, the factors which might contribute to the mortality (Table 6), such as age more than 60 years, presence of peritonitis, hypotension, arterial nature, time interval between admission and operation or treatment more than 24 hours, bowel gangrene >100 cms, did not, unfortunately, show statistically significant association because of too small sample size.

In conclusion, the mortality rate of AMI is still high even at the tertiary hospital where the angiography is available 24 hours. To decrease the mortality rate, the physicians must have the high index of suspicion in high risk patients according to the AGA recommendation and do not hesitate to perform early mesenteric angiography.

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ภาวะลำไส้ขาดเลือดอย่างเฉียบพลัน:อัตราตายยังคงสูงในยุคสมัยที่สามารถทำการฉีดสีผ่านทางเส้นเลือดแดงได้ตลอด 24 ชั่วโมง

บัณฑูร นนทสูติ, ธวัชชัย ตุลวรรธนะ, บุญชู ศิริจินดากุล, เจษฎ์ ศุภผล, สุภนิติ์ นิวาตวงศ์

ภาวะลำไส้ขาดเลือดอย่างเฉียบพลัน เป็นภาวะที่ร้ายแรงมีอัตราตายสูง เนื่องจากความยากและความล่าช้าในการวินิจฉัย ในการที่จะลดอัตราตายนั้น ต้องอาศัยการประเมินผู้ป่วยกลุ่มเสี่ยงโดยใช้การฉีดสีผ่านทางเส้นเลือดแดงที่ไปเลี้ยงลำไส้เพื่อให้ได้การวินิจฉัยตั้งแต่ในระยะแรก แต่การฉีดสีผ่านทางเส้นเลือดแดงไม่สามารถทำได้ตลอด 24 ชั่วโมงในโรงพยาบาลส่วนใหญ่ของประเทศไทย อีกทั้งยังเสี่ยงต่อการเกิดภาวะแทรกซ้อน และให้ผลการตรวจเป็นลบค่อนข้างมาก

คณะผู้วิจัยจึงได้ทำการศึกษานี้ขึ้นเพื่อให้ทราบถึง อัตราตายของผู้ป่วยภาวะลำไส้ขาดเลือดอย่างเฉียบพลัน, ปัจจัยที่เกี่ยวข้อง และอัตราการฉีดสีผ่านทางเส้นเลือดแดงในผู้ป่วยกลุ่มเสี่ยงในโรงพยาบาลจุฬาลงกรณ์ ที่ซึ่งสามารถทำการฉีดสีผ่านทางเส้นเลือดแดงได้ตลอด 24 ชั่วโมง

การศึกษานี้ มีผู้ป่วยทั้งหมด 35 คน ในระหว่างปี พ.ศ. 2543 ถึง พ.ศ.2548 มีอัตราตาย 79.3% มีผู้ป่วยกลุ่มเสี่ยง 22 คน ซึ่งมีอัตราการฉีดสีผ่านทางเส้นเลือดแดงเพียง 4.5% (1/22) ปัจจัยที่น่าจะมีผลต่ออัตราตาย เช่น อายุมากกว่า 60 ปี, การอักเสบของเยื่อบุช่องท้อง, ความดันโลหิตต่ำ, สาเหตุจากเส้นเลือดแดงอุดตัน, ระยะเวลาตั้งแต่เข้านอนโรงพยาบาลถึงการผ่าตัดมากกว่า 24 ชั่วโมง, ลำไส้เน่ามากกว่า 100 ซม. ในการศึกษานี้ พบว่าไม่มีความสัมพันธ์กันอย่างมีนัยสำคัญทางสถิติ

กล่าวโดยสรุป อัตราตายของผู้ป่วยภาวะลำไส้ขาดเลือดอย่างเฉียบพลันในโรงพยาบาลจุฬาลงกรณ์ยังคงสูง ถึงแม้ว่าจะสามารถทำการฉีดสีผ่านทางเส้นเลือดแดงได้ตลอด 24 ชั่วโมง ในการที่จะลดอัตราตายนั้น แพทย์ผู้รักษาจะต้องมีความสงสัยภาวะนี้อย่างสูงในผู้ป่วยกลุ่มเสี่ยง และต้องไม่ลังเลที่จะส่งทำการฉีดสีผ่านทางเส้นเลือดแดงตั้งแต่ระยะแรก