

# Time Over 8 Hours from Trauma to Operation Increases Morbidity and Mortality After Blunt Small Bowel and Mesentery Injury : A Retrospective Single Center Study

Szu-Tsen Lai<sup>1</sup>, Tzu-Chieh Lin<sup>1</sup>, Cheng-En Mei<sup>1</sup>, Chien-Lun Tang<sup>1</sup>, Kuo-Chen Chung<sup>1</sup>,  
Tai-Li Huang<sup>1</sup>, Sung-Yuan Hu<sup>1</sup>, Jian-Jhou Liao<sup>2</sup>

<sup>1</sup> Division of Traumatology, <sup>2</sup> Division of General Surgery, Department of Surgery, Taichung Veterans General Hospital, Taichung, Taiwan

## Introduction

Blunt small bowels and mesentery injury (BSBMI) is uncommon and a timely diagnosis can be difficult. In addition, several studies have suggested delay of time to operation has been implicated as a risk factor for mortality and morbidity [1-4]. However, the timing of surgery for BSBMI after arrival at ED remain controversial. In the current study, the outcome of BSBMI were retrospectively compared based on the time to surgery. We hypothesized that there was a time threshold (< 8 hours) in the management of BSBMI after which the outcomes would worsen.

## Methods

In the study, we retrospective reviewed the medical records of adult patients with a diagnosis of BSBMI from January 2017 through December 2022 in Taichung Veterans General Hospital. Patients who did not undergo abdominal operation, died within 24 hours, underwent other abdominal organ surgeries (solid organ, duodenum, large bowel) were excluded. Data regarding patient clinical characteristics, ISS, admission of vital signs, GCS, time from injury until laparotomy, the length of stays (LOS), intensive care unit (ICU) LOS, mortality, and morbidity. The enrolled patients were two groups based on injury-to-surgery time interval:  $\leq 8$  and  $\geq 8$ h. We analyzed the length of stays (LOS), intensive care unit (ICU) LOS, mortality, and morbidity, as patient outcomes.

## Results

Comparison of the outcomes between operation  $\leq 8$ h and  $\geq 8$ h

	Total (n=76)	Surgery less than 8 hours after arrival at the ED (n=32)	Surgery less than 8 hours after arrival at the ED (n=44)	p value
Age (years), mean±SD	51.39±17.32	55.00±17.74	48.77±16.72	0.119
Male(%)	57(75%)	22(68.75%)	35(79.54%)	0.421
SBP in ED (mmHg)	121.50±26.39	119.56±24.69	122.91±27.75	0.752
Pulse in ED (/mm)	92.53±19.47	95.88±18.79	90.09±19.80	0.243
RR in ED (min)	19.34±2.74	19.50±2.94	19.23±2.62	0.717
GCS in ED	14.28±1.92	14.47±1.14	14.14±2.34	0.467
Oxygen saturation (%)	97.66±2.49	97.00±2.83	98.14±2.12	0.046*
Comorbidity (%)	30(38.9)	120 (32.4)	99 (26.8)	0.024
ISS,	12.86±7.83	13.63±8.24	12.30±7.57	0.522
Morbidity(%)	20(26.31%)	14(43.75%)	6(13.63%)	0.007*
Mortality (%)	5(6.58%)	4(12.50%)	1(2.27%)	0.015*
Hospital LOS (days)	22.21±21.77	30.81±28.27	15.95±12.45	0.004*
ICU LOS (days)	6.93±13.34	12.22±18.55	3.09±5.13	0.066

Data are shown as Numerical data: Mean±SD (standard deviation); Nominal data: no.(percentage). ED, emergency department; SBP, systemic blood pressure; RR, respiratory rate; GCS Glasgow Coma Scale; ISS, injury severity score; LOS, length of stay; ICU, intensive care unit.

	survival (n=71)	expired (n=5)	p value
Age (years)	51.01±16.74	56.80±26	0.55
Male(%)	53(74.64%)	4(80%)	1.0
SBP in ED (mmHg)	121.27±26.78	124.80±22.30	0.730
Pulse in ED (/mm)	92.41±19.47	94.20±21.66	0.839
RR in ED (min)	19.44±2.80	18.00±1.41	0.129
GCS in ED	14.47±1.14	14.14±2.34	0.467
Oxygen saturation (%)	97.69±2.50	97.20±2.59	0.669
ISS	12.39±7.26	19.40±13.09	0.153
Time to abdominal surgery	977.61±2225.1	1974.40±1297.7	0.017*
Morbidity(%)	17(23.94%)	3(60%)	0.111
Hospital LOS (days)	20.90±19.35	40.80±43.19	0.699
ICU LOS (days)	5.32±9.56	29.80±32.17	0.007*

	Without Morbidity (n=55)	With Morbidity (n=21)	p value
Age (years)	48.35±16.64	59.38±16.89	0.014*
Male(%)	44(80%)	13(61.9%)	0.183
SBP in ED (mmHg)	122.65±26.99	118.48±25.12	0.667
Pulse in ED (/mm)	90.42±19.36	98.05±19.11	0.155
RR in ED (min)	19.51±2.56	18.90±3.21	0.313
GCS in ED	14.40±1.94	13.95±1.88	0.022*
Oxygen saturation (%)	97.85±2.18	97.14±3.17	0.460
ISS	13.63±8.24	12.30±7.57	0.522
Time to surgery (min)	988.89±2490.81	1185.38±1057.63	0.017*
Mortality (%)	2(3.64%)	3(14.29%)	0.126
Hospital LOS (days)	15.24±11.82	40.48±30.25	<0.001**
ICU stay	19(34.54%)	14(66.66%)	0.012*
ICU LOS (days)	2.38±4.45	18.86±20.18	<0.001**

Multivariate Analysis of Risk Factors for mortality in Patients with BSBMI was done.

	Multivariate analysis	p value
Variable	OR (95% C.I.)	
Age (yr)	1.02 (1.01-1.1)	0.004
ISS	0.954 (0.90-0.999)	0.047
Time to laparotomy $\geq 8$ hours	2.5 (1.0-1.32)	0.017*
Shock in ED	1.58(0.35-4.89)	0.685

## Conclusion

In the management of BSBMI patients, delay time from injury to operative intervention of more than 8 hours is associated with an increased morbidity and mortality. A high index of suspicion is needed to make a timely diagnosis and minimize risk.