

# Impact of Total Ischemic Time on the Recovery of Regional Wall Motion Abnormality after STEMI

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**Background/Aims:** Total ischemic time (TIT) is known to be an important factor for predicting the mortality in patients with ST-segment elevation myocardial infarction (STEMI). However, the correlation between TIT and the extent of wall motion abnormality has not been well studied. Therefore, we investigated the changes in the wall motion score index (WMSI) based on TIT in STEMI patients underwent primary percutaneous coronary intervention (PCI) and subsequent transthoracic echocardiography.

**Methods:** STEMI patients underwent primary PCI and follow-up coronary angiography were analyzed between September 2010 and September 2020 after exclusion of in-stent restenosis (ISR). The WMSI was calculated by dividing the sum of scores by the number of segments visualized.

**Results:** A total of 189 patients underwent primary PCI for STEMI, and 151 had no ISR with a median follow-up of 12.3 months. Door to balloon time was 49 [38-61] minutes and TIT was 180 [117-369] minutes in a subset of 151 patients (mean age of 62 years, 76% male). Of patients without ISR, 109 (72%) showed a decrease in WMSI during the follow-up. The WMSI in patients with TIT ≤ 180 minutes significantly decreased compared to those with TIT > 180 minutes ( $p = 0.020$ ). In patients with TIT ≤ 180 minutes, TIT was significantly shorter in patients with a decrease in WMSI than those with an increase in WMSI (106 [81-124] vs. 133 [100-151] minutes,  $p = 0.018$ ). In multivariate analysis, TIT was an independent predictor for a decrease in the WMSI of these patients (adjusted hazard ratio (HR): 0.976 (0.957-0.995),  $p = 0.016$ ).

**Conclusions:** In the modern reperfusion era of STEMI, patients with TIT ≤ 180 minutes showed a significant recovery of regional wall motion abnormality compared to those who did not. Every possible effort should be concentrated on reduction of TIT to 180 minutes.

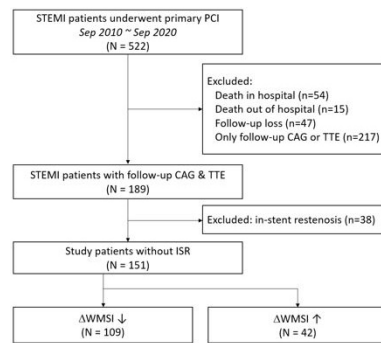


Figure 1. Flow diagram

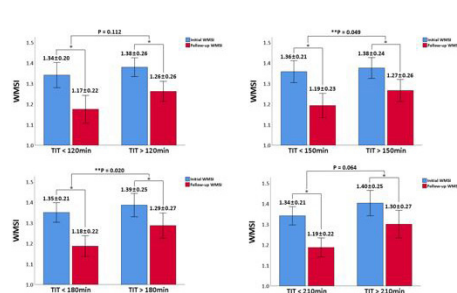


Figure 2. The change of wall motion score index (WMSI) based on total ischemic time (TIT)

	ΔWMSI ↓ (n = 109)	ΔWMSI ↑ (n = 42)	P value
<b>Demographics</b>			
Age, years	62 ± 13	61 ± 10	0.565
Male	82 (75)	33 (79)	0.666
Body mass index, kg/m <sup>2</sup>	24.1 ± 3.0	24.5 ± 3.0	0.494
<b>Medical history</b>			
Diabetes	36 (33)	12 (28)	0.598
Hypertension	52 (48)	24 (57)	0.299
Smoking ever	52 (48)	21 (50)	0.850
Previous stroke	6 (5.5)	1 (2.4)	0.413
Previous PCI	7 (6.4)	0 (0.0)	0.093
<b>Clinical presentation</b>			
STEMI location			0.075
Anterior	57 (52)	13 (31)	
Inferior	44 (40)	24 (57)	
Lateral	5 (4.6)	5 (12)	
Posterior	2 (1.8)	0 (0.0)	
Killip class			0.621
I	74 (68)	32 (76)	
II	17 (16)	7 (17)	
III	5 (4.6)	1 (2.4)	
IV	13 (12)	2 (4.8)	
<b>Extent of CAD</b>			0.222
1VD	86 (79)	38 (91)	
2VD	20 (18)	3 (7.1)	
3VD	3 (2.8)	1 (2.4)	
Door-to-balloon time, minutes	49 (38-62)	48 (36-58)	0.453
Door-to-balloon time < 60 minutes	80 (73)	33 (79)	
Total ischemic time, minutes	178 (105-368)	204 (133-372)	0.232
Total ischemic time < 120 minutes	35 (32)	7 (17)	
120 minutes < Total ischemic time < 150 minutes	12 (11)	7 (17)	
150 minutes < Total ischemic time < 180 minutes	8 (7.3)	5 (12)	
180 minutes < Total ischemic time < 210 minutes	7 (6.4)	3 (7.1)	
<b>Medications</b>			
Aspirin	109 (100)	42 (100)	
Clopidogrel	92 (84)	31 (74)	0.133
Ticagrelor	4 (3.7)	4 (9.5)	0.150

	ΔWMSI ↓ (n = 109)	ΔWMSI ↑ (n = 42)	P value
LV end-diastolic dimension, mm	48.2 ± 4.1	50.0 ± 4.8	0.027
LV end-systolic dimension, mm	32.3 ± 4.5	34.0 ± 6.3	0.064
Interventricular septum thickness, mm	9.7 ± 1.4	9.8 ± 1.1	0.700
LV posterior wall thickness, mm	9.6 ± 1.2	9.9 ± 1.2	0.256
LV ejection fraction, %	55.4 ± 10.0	55.4 ± 8.7	0.993
LA volume index, ml/m <sup>2</sup>	33.4 ± 11.4	33.9 ± 9.0	0.812
Early diastolic mitral inflow velocity (E), m/s	0.59 ± 0.19	0.65 ± 0.20	0.201
Late diastolic mitral inflow velocity (A), m/s	0.74 ± 0.18	0.76 ± 0.21	0.465
Mitral annulus early diastolic velocity (e'), m/s	0.06 ± 0.02	0.07 ± 0.07	0.477
E/e'	10.8 ± 5.0	12.6 ± 5.9	0.064
RV systolic pressure, mm Hg	25.5 ± 8.5	25.8 ± 10.1	0.840

	ΔWMSI ↓ (n = 55)	ΔWMSI ↑ (n = 19)	P value
Age	61 ± 14	61 ± 11	0.971
Male	44 (80)	14 (74)	0.564
Body mass index	24.2 ± 2.8	25.2 ± 3.1	0.188
Diabetes	14 (26)	7 (37)	0.343
Hypertension	27 (49)	12 (63)	0.290
Smoking ever	26 (47)	6 (32)	0.234
STEMI, anterior	29 (53)	7 (37)	0.232
Total ischemic time, minutes	108 ± 34	127 ± 32	0.088
CK-MB	134 ± 103	168 ± 113	0.244
LV end-diastolic dimension, mm	47.9 ± 3.9	49.1 ± 5.7	0.301

	Univariate OR (95% CI)	P value	Multivariate OR (95% CI)	P value
Total ischemic time, minutes	0.980 (0.964-0.997)	0.023	0.976 (0.957-0.995)	0.016

\*Adjusted by age, sex, body mass index, diabetes, hypertension, smoking.