Two-year Outcomes after Left Main Coronary Artery Percutaneous Coronary Intervention in Patients Presenting with Acute Coronary Syndrome

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Disclosure Statement of Financial Interest

I, Sida Jia, DO NOT have a financial interest/arrangement or affiliation with one or more organizations that could be perceived as a real or apparent conflict of interest in the context of the subject of this presentation.
Background

- PCI of left main coronary artery (LMCA) has been a safe and effective revascularization strategy in patients with low SYNTAX score and stable coronary artery disease (SCAD).

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**2018 ESC/EACTS Guidelines on myocardial revascularization**

**Recommendation for the type of revascularization in patients with stable coronary artery disease with suitable coronary anatomy for both procedures and low predicted surgical mortality:**

| Recommendations according to extent of CAD | CABG | PCI |
|-------------------------------------------|------|-----|
|                                          | Class | Level | Class | Level |
| Left main CAD                             |      |       |      |       |
| Left main disease with low SYNTAX score (0–22) [69, 121, 122, 124, 145–148] | I    | A    | I    | A    |
| Left main disease with intermediate SYNTAX score (23–32) [69, 121, 122, 124, 145–148] | I    | A    | IIa   | A    |
| Left main disease with high SYNTAX score (≥33) [69, 121, 122, 124, 146–148] | I    | A    | III   | B    |
Studies on long-term clinical outcomes of LMCA PCI in Acute Coronary Syndrome (ACS) patients are relatively rare.

We aim to evaluate long-term clinical outcome of LMCA PCI in patients presenting with ACS in our real-world, prospective, large-sample cohort of Chinese patients.

Recommendations for invasive evaluation and revascularization in non-ST-elevation acute coronary syndrome

It is recommended to base the revascularization strategy (ad hoc culprit lesion PCI/multivessel PCI/CABG) on the clinical status and comorbidities, as well as the disease severity [i.e. the distribution and angiographic lesion characteristics (e.g. SYNTAX score)], according to the principles for SCAD. \(^{194}\)
Methods

• A total of 6429 consecutive patients with Acute Coronary Syndrome (ACS) who underwent PCI in Fuwai Hospital in 2013 were enrolled. All patients were evaluated by clinic visit or by phone at 1, 6, 12 and 24 months.

• Patients are divided into Left Main (LMCA) group and non-Left Main (Non-LMCA) group according to whether LMCA is a target vessel.

• Prognosis impact on 2-year major adverse cardiovascular and cerebrovascular events (MACCE) is analyzed across 2 groups.
Endpoints and Definitions

- **All-cause death**: death resulting from any reason, including cardiac death.
- **Cardiac death**: death that could not be attributed to a noncardiac etiology.
- **Myocardial Infarction (MI)**: the third universal definition of MI.
- **Revascularization**: repeated revascularization for ischemic symptoms and events driven by PCI or surgery of any vessel.
- **Stent thrombosis (ST)**: defined according to the Academic Research Consortium, including definite, probable and possible in the analysis.
- **Bleeding**: quantified according to Bleeding Academic Research Consortium (BARC) definition criteria, including type 2, 3 and 5 in the analysis.
- **MACCE**: a composite event of death, MI, Revascularization, ST and stroke during follow-up.
Statistical Analysis

- Continuous variables are expressed as mean ± standard deviation, and categorical variables are presented as percentages.
- Differences in baseline characteristics and in-hospital outcomes between groups were assessed using the chi-square test or Fisher's exact test for categorical variables and Student t test or the Wilcoxon rank test for continuous variables, as appropriate.
- Survival curves were constructed using Kaplan-Meier method.
- Cox regression analyses were conducted to evaluate the adjusted effect of LMCA PCI on 2-year clinical endpoints.
- To minimize the effect of confounding factors caused by differences in baseline characteristics between LMCA and non-LMCA group, Propensity Score Match (PSM) was performed. (Matched variables: LMCA, age, diabetes, hemoglobin, GFR, STEMI, UA, preprocedural SYNTAX score, puncture site, staged PCI, IVUS, IABP, Successful PCI, stent type..)
# Baseline Characteristics

## Table 1 Baseline Patient Characteristics

|                        | Before PSM |          |          |          |          |          |          |          |
|------------------------|------------|----------|----------|----------|----------|----------|----------|----------|
|                        | LMCA       | Non-LMCA | P value  | LMCA     | Non-LMCA | P value  | LMCA     | Non-LMCA | P value  |
|                        | (n=155)    | (n=6274) |          | (n=150)  | (n=150)  |          | (n=150)  | (n=150)  |          |
| Age                    | 61.91 ± 9.80 | 58.29 ± 10.41 | <0.001 | 61.96 ± 9.68 | 60.97 ± 11.02 | 0.411 |
| Female, n(%)           | 40 (25.8)  | 1452 (23.1) | 0.438 | 39 (26.0)  | 41 (27.3) | 0.794 |
| Body Mass Index, kg/m² | 25.58 ± 2.98 | 25.89 ± 3.20 | 0.233 | 25.64 ± 2.98 | 25.41 ± 3.58 | 0.545 |
| Risk factors and history, n(%) |          |          |          |          |          |          |          |          |
| Smoker                 | 89 (57.4)  | 3755 (59.9) | 0.542 | 86 (57.3)  | 79 (52.7) | 0.417 |
| Diabetes               | 56 (36.1)  | 1791 (28.5) | 0.039 | 55 (36.7)  | 52 (34.7) | 0.718 |
| Hypertension           | 92 (59.4)  | 3993 (63.6) | 0.273 | 89 (59.3)  | 95 (63.3) | 0.477 |
| Hyperlipidemia         | 101 (65.2) | 4125 (65.7) | 0.879 | 98 (65.3)  | 105 (70.0) | 0.388 |
| Prior Myocardial Infarction | 27 (17.4) | 828 (13.2) | 0.126 | 26 (17.3)  | 18 (12.0) | 0.192 |
| Prior Stroke           | 20 (12.9)  | 674 (10.7) | 0.392 | 19 (12.7)  | 19 (12.7) | 1.000 |
| Laboratory Tests       |            |          |          |          |          |          |          |          |
| Leukocyte, x 10⁹/L    | 7.22 ± 1.97 | 7.08 ± 2.10 | 0.430 | 7.22 ± 1.97 | 7.27 ± 2.21 | 0.828 |
| Platelet, x 10⁹/L     | 209.97 ± 59.71 | 208.51 ± 57.02 | 0.757 | 209.97 ± 59.71 | 211.13 ± 58.61 | 0.865 |
| Hemoglobin, g/L       | 134.16 ± 14.73 | 140.83 ± 16.15 | <0.001 | 134.16 ± 14.73 | 134.73 ± 15.71 | 0.745 |
| Creatinine, umol/L    | 76.55 ± 18.90 | 76.03 ± 16.41 | 0.697 | 76.40 ± 18.94 | 76.95 ± 17.96 | 0.046 |
| GFR, ml/min           | 87.71 ± 16.22 | 91.03 ± 15.54 | 0.009 | 87.79 ± 16.36 | 88.29 ± 17.44 | 0.799 |
| LVEF, %               | 62.82 ± 6.95 | 62.28 ± 7.46 | 0.375 | 62.96 ± 6.85 | 60.83 ± 9.48 | 0.028 |
## Baseline Characteristics

|                  | Before PSM                  | After PSM                  |
|------------------|-----------------------------|----------------------------|
|                  | LMCA (n=155)                | LMCA (n=150)               |
|                  | Non-LMCA (n=6274)           | Non-LMCA (n=150)           |
|                  | P value                     | P value                    |
| Clinical Presentation |                             |                            |
| STEMI            | 24 (15.5)                   | 23 (15.3)                  |
|                  | 1421 (22.6)                 | 36 (24.0)                  |
|                  | 0.035                       | 0.059                      |
| NSTEMI           | 11 (7.1)                    | 10 (6.7)                   |
|                  | 464 (7.4)                   | 12 (8.0)                   |
|                  | 0.888                       | 0.658                      |
| UA               | 120 (77.4)                  | 117 (78.0)                 |
|                  | 4389 (70.0)                 | 102 (68.0)                 |
|                  | 0.045                       | 0.051                      |
| Medication at Discharge, n (%) |                     |                            |
| Aspirin          | 154 (99.4)                  | 149 (99.3)                 |
|                  | 6185 (98.6)                 | 149 (99.3)                 |
|                  | 0.726                       | 1.000                      |
| Clopidogrel      | 154 (99.4)                  | 149 (99.3)                 |
|                  | 6258 (99.7)                 | 149 (99.3)                 |
|                  | 0.340                       | 1.000                      |
| Ticagrelor       | 1 (0.6)                     | 1 (0.7)                    |
|                  | 13 (0.2)                    | 1 (0.7)                    |
|                  | 0.290                       | 1.000                      |
| β-blockers       | 146 (94.2)                  | 142 (94.7)                 |
|                  | 5575 (88.9)                 | 141 (94.0)                 |
|                  | 0.036                       | 0.803                      |
| Calcium Channel Blockers | 80 (51.6) | 76 (50.7) | 0.355 |
|                  | 3121 (49.7)                 | 68 (45.3)                  |
| Nitrates         | 154 (99.4)                  | 149 (99.3)                 |
|                  | 6141 (97.9)                 | 147 (98.0)                 |
|                  | 0.382                       | 0.622                      |
| Statins          | 150 (96.8)                  | 146 (95.3)                 |
|                  | 6011 (95.8)                 | 140 (93.3)                 |
|                  | 0.552                       | 0.169                      |
### Angiographic findings and Interventional Therapies

|                        | Before PSM | After PSM |
|------------------------|------------|-----------|
|                        | LMCA (n=155) | Non-LMCA (n=6274) | P value | LMCA (n=150) | Non-LMCA (n=150) | P value |
| **SYNTAX score**       |            |           |         |            |           |         |
| Pre-procedure          | 20.11 ± 9.98 | 11.34 ± 7.83 | <0.001  | 19.85 ± 9.89 | 19.89 ± 9.88 | 0.970   |
| Post-procedure         | 2.91 ± 5.29  | 3.32 ± 5.67  | 0.368   | 2.80 ± 5.28  | 4.49 ± 6.72  | 0.016   |
| Unprotected LMCA       | 147 (94.8) | -          | -       | 142 (94.7) | -          | -       |
| Tri-vessel Disease, %  | 21 (13.5)  | 107 (1.7)  | <0.001  | 13 (8.7)    | 0 (0)      | <0.001  |
| Total Occlusion, %     | 33 (21.3)  | 1350 (21.5) | 0.946   | 32 (21.3)   | 64 (42.7)   | <0.001  |
| **Puncture Site, %**   |            |           |         |            |           |         |
| Femoral Artery         | 20 (12.9)  | 431 (6.9)  |         | 20 (13.3)  | 18 (12.0)  | 0.558   |
| Radial Artery          | 132 (85.2) | 5749 (91.6)| 0.014   | 127 (84.7) | 131 (87.3) | 1.000   |
| Other Approaches       | 3 (1.9)    | 94 (1.5)   |         | 3 (2.0)    | 1 (0.7)    |         |
| **Staged PCI, %**      |            |           |         |            |           |         |
| IVUS Usage, %          | 53 (34.2)  | 570 (9.1)  | <0.001  | 53 (35.3)  | 55 (36.7)  | 0.810   |
| IABP Usage, %          | 71 (45.8)  | 261 (4.2)  | <0.001  | 71 (47.3)  | 71 (47.3)  | 1.000   |
| Successful PCI, %      | 152 (98.1) | 6166 (98.3)| 0.751   | 148 (98.7) | 148 (98.7) | 1.000   |
| PTCA Only, %           | 60 (38.7)  | 1024 (17.1)| <0.001  | 60 (40.0)  | 59 (39.3)  | 1.000   |
| **Stent Type**         |            |           |         |            |           |         |
| BMS %                  | 0 (0)      | 46 (0.8)   | 0.285   | 0 (0)      | 1 (0.7)   | 1.000   |
| DES, %                 |            |           |         |            |           |         |
| 1G-DES                 | 17 (11.0)  | 1150 (19.2)| 0.019   | 16 (10.7)  | 13 (8.7)   | 0.558   |
| 2G-DES                 | 59 (38.1)  | 2706 (45.1)| 0.208   | 57 (38.0)  | 53 (35.3)  | 0.632   |
| BP-DES                 | 19 (12.3)  | 957 (16.0) | 0.305   | 23 (15.3)  | 17 (11.3)  | 0.308   |
| Others                 | 0 (0)      | 88 (1.5)   | 0.277   | 0 (0)      | 1 (0.7)   | 1.000   |
| Blended Multiple DESs  | 0 (0)      | 28 (0.5)   | 1.000   | 0 (0)      | 0 (0)      | 1.000   |
## Two year Clinical Outcomes

|                          | Before PSM                | After PSM                |
|--------------------------|---------------------------|--------------------------|
|                          | LMCA (n=155)              | Non-LMCA (n=6274)        |                         |
| **p Value**              |                           |                          |                          |
| All-cause Death          | 4 (2.6)                   | 82 (1.3)                 | 0.153                   |
| Cardiac Death            | 4 (2.6)                   | 47 (0.7)                 | **0.034**               |
| Myocardial Infarction    | 11 (7.1)                  | 116 (1.8)                | <**0.001**              |
| Target Vessel Related    | 8 (5.2)                   | 52 (0.8)                 | <**0.001**              |
| Target Lesion Related    | 2 (1.3)                   | 31 (0.5)                 | 0.188                   |
| Unplanned Revascularization | 10 (6.5)             | 546 (8.7)                | 0.325                   |
| Target Vessel Related    | 9 (5.8)                   | 146 (94.2)               | 0.722                   |
| Target Lesion Related    | 7 (4.5)                   | 148 (95.5)               | 0.755                   |
| Stent Thrombosis         | 7 (4.5)                   | 51 (0.8)                 | <**0.001**              |
| Stroke                   | 6 (3.9)                   | 88 (1.4)                 | **0.025**               |
| Bleeding                 | 11 (7.1)                  | 401 (6.4)                | 0.723                   |
| MACCE                    | 24 (15.5)                 | 768 (12.2)               | 0.225                   |
|                          |                          |                          |                          |
|                          | 3 (2.0)                   | 2 (1.3)                  | 1.000                   |
|                          | 3 (2.0)                   | 0 (0)                    | 0.247                   |
|                          | 11 (3.0)                  | 2 (1.3)                  | **0.011**               |
|                          | 8 (5.3)                   | 3 (2.0)                  | 0.125                   |
|                          | 2 (1.3)                   | 1 (0.7)                  | 1.000                   |
|                          | 10 (6.7)                  | 15 (10.0)                | 0.296                   |
|                          | 9 (6.0)                   | 9 (6.0)                  | 1.000                   |
|                          | 7 (4.7)                   | 7 (4.7)                  | 1.000                   |
|                          | 6 (4.0)                   | 2 (1.3)                  | 0.282                   |
|                          | 5 (3.3)                   | 6 (4.0)                  | 0.759                   |
|                          | 11 (7.3)                  | 6 (4.0)                  | 0.212                   |
|                          | 22 (14.7)                 | 23 (15.3)                | 0.872                   |
Kaplan–Meier Survival Curves

All-cause Death

Unplanned Revascularization

In-stent Thrombosis

Bleeding

MACCE

Log Rank P=0.134

Log Rank P=0.153

Log Rank P=0.355

Log Rank P=0.900

Log Rank P=0.714
Kaplan–Meier Survival Curves

Cardiac Death

Myocardial Infarction

Stroke

Log Rank P=0.005

Log Rank P=0.005

Log Rank P=0.010
Cox Regression Analysis

Adjusted variables: age, diabetes, hemoglobin and GFR level, clinical presentation, preprocedural SYNTAX score, puncture site, staged PCI, IVUS and IABP usage, successful PCI and stent type
Cox Regression Analysis

Multivariate Cox Regression Analysis of LMCA PCI on clinical outcomes

| Clinical Event                  | Hazard Ratio (95% CI)          |
|--------------------------------|--------------------------------|
| All-cause Death                | 2.161 (0.155 - 30.167)        |
| Cardiogenic Death              | > 10.992 (2.000-60.417)       |
| Myocardial Infarction          | 10.992 (2.000-60.417)         |
| Revascularization              | 0.617 (0.267 - 1.425)         |
| In-stent Thrombosis            | 4.292 (0.641 - 28.747)        |
| Stroke                         | 0.810 (0.237 - 2.766)         |
| Bleeding                       | 2.435 (0.834 - 7.113)         |
| MACCE                          | 0.994 (0.544 - 1.813)         |

Adjusted variables: age, diabetes, hemoglobin and GFR level, clinical presentation, preprocedural SYNTAX score, puncture site, staged PCI, IVUS and IABP usage, successful PCI and stent type
Limitations

• Unknown culprit vessel causing ACS.

• Limited sample size in LMCA group.

• Due to the observational study design, despite adjusting for unmatched baseline characteristics, potential unknown risk factors still exist.

• IVUS results, post-dilatation results, whether patients received emergency or selective PCI and stenting technique for bifurcation lesions is unknown.
Conclusion

• In patients presenting with ACS, LMCA-targeted PCI is associated with higher risk of 2-year cardiac death, MI, in-stent thrombosis and stroke.

• Compared with non-LMCA targeted PCI, LMCA-targeted PCI is an independent risk factor for 2-year MI.
Thanks for your attention