The Randomized Study of Endovascular Therapy With versus Without Intravenous Tissue Plasminogen Activator in Acute Stroke With ICA and M1 Occlusion (SKIP Study)

Kentaro Suzuki (Nippon Medical School), Yuji Matsumaru and Kazumi Kimura, for the SKIP study investigators

International Stroke Conference 2020, 21th Feb, 2019 Los Angeles
✓ SKIP study received funding for trial implementation and management from the Japanese society for neuroendovascular therapy (JSNET).

✓ The authors and each committee member received lecture fees and research funding.

ISC discussed today’s topic 3 years ago
Background

✓ Both IV tPA (IVT) and Mechanical Thrombectomy (MT) have an evidence for benefits in ischemic stroke patients.
Background

✓ Both IV tPA (IVT) and Mechanical Thrombectomy (MT) have an evidence for benefits in ischemic stroke patients.

✓ We really don’t know whether IVT before MT is needed for LVO patients.
IVT early recanalization rate in LVO patients

Recanalization rate at 1 h after IVT


Recanalization rate of IVT in LVO patients is low
Hemorrhagic risk of IVT

The rate of blood clot exceeding 30% of the infarct volume

Placebo
1.7%

IVT
5.9%

Severe hemorrhagic risk of IVT becomes 3 times

The ATLANTIS, ECASS, and NINDS rt-PA study Group Investigators. LANCET 2004.
Why did we conduct SKIP study?

We would like to know the ANSWER

※ If we skip IV tPA ・ ・ ・

- Lower hemorrhagic risk
- No prohibition of antithrombotic agents
- Low cost

- Missing reperfusion opportunity
- Delaying the initial therapy
How was the HERMES collaboration?

※Ineligible for IVT

Best Medical treatment  n=80

Best Medical treatment + MT  n=108

※Eligible for IVT

Best Medical treatment  n=565

Best Medical treatment + MT  n=525

HERMES collaboration (MR CLEAN, ESCAPE, REVASCAT, SWIFT PRIME and EXTEND IA) Mayank Goyal et al. LANCET 2016.
How was the HERMES collaboration?

※Ineligible for IVT

Best Medical treatment $n=80$

Best Medical treatment + MT $n=108$  $\equiv$ Direct MT therapy

※Eligible for IVT

Best Medical treatment $n=565$

Best Medical treatment + MT $n=525$  $\equiv$ Bridging therapy

The rate of mRS 0-2: no difference

HERMES collaboration (MR CLEAN, ESCAPE, REVASCAT, SWIFT PRIME and EXTEND IA) Mayank Goyal et al. LANCET 2016.
How was the subgroup analysis from HERMES?

No difference between With vs. Without IVT

[Diagram showing outcome at 90 days with IVT (Yes vs. No) and favoring control or MT (0.5-5.0)]
Can we say **Similar** with or without IVT??

- **No!**

Most patients without IVT in HERMES collaboration included IVT ineligible patients.

We need a RCT in eligible IVT patients.
How were the cohort studies?

Direct MT < Bridging therapy

Symptomatic ICH

Direct MT = Bridging therapy

Direct better · Bridging better

Can we say Bridging therapy is better??

• No!

Most patients without IVT in Cohort studies included IVT ineligible patients.
Can we say Bridging therapy is better??

Phan K et al analyzed 12 studies (5 RCTs and 7 prospective cohorts).

In the direct MT group, only 22% (248/248+878) patients were eligible IVT.

We cannot say that IVT before MT is essential.

Purpose

✓ We studied whether direct MT therapy in the patients with LVO has non-inferior efficacy and lower risk of any ICH compared to bridging therapy.
Trial Design

✓ Multicenter, Randomized, Open-labeled trial

✓ Registration period: Jan 2017 – July 2019

✓ Trial registration: UMIN 000021488

✓ Protocol


✓ Registration: 23 sites, 200 cases
Inclusion criteria

- Age ≥ 18 or < 86 years at the time of giving informed consent
- Clinical diagnosis of acute ischemic stroke with clinical symptom.
- Pre-mRS score ≤ 2
- ICA or M1 occlusion on MRA or CTA
- Initial NIHSS score ≥ 6
- Baseline ASPECTS ≥ 6 or DWI ASPECTS ≥ 5
- Puncture within 4 h from onset.
- Written informed consent by patient or relatives.
Exclusion criteria

✓ Contraindication of contrast agent or endovascular therapy
✓ Contraindication of IVT
✓ Presence of severe renal disorder (patients undergoing introduction of dialysis can be included)
✓ Pregnancy or possibility of pregnancy
✓ Unlikely to complete the study, such as due to progressive malignant tumor
✓ Judged as incompatible for the study by the investigators
Study Design

Subjects
- Acute ischemic stroke
- Within 4h from onset
- ICA/M1 occlusion
- CT-ASPECTS ≥ 6, DWI ≥ 5

Clinical assessment
- Angiogram assessment
- CT within 36 h (ICH)
- CTA/MRA within 48 h
- NIHSS score at baseline, 24h and 72h
- mRS at 90 days

Direct MT group (MT without tPA)

Bridging group (MT with tPA)

R; randomization, F; follow up
Efficacy outcomes

✓ Primary: mRS score 0-2 at 90 days

✓ Secondary:
  1. mRS score (Shift analysis)
  2. mRS score 0-2 (Per protocol analysis)
  3. Death at 90 days
  4. Reperfusion rate at MT (TICI grade ≥2B)
Efficacy outcomes

✓ Primary: mRS score 0-2 at 90 days

✓ Secondary:
  1. mRS score (Shift analysis)
  2. mRS score 0-2 (Per protocol analysis)
  3. Death at 90 days
  4. Reperfusion rate at MT (TICI grade ≥ 2B)
To satisfy the non-inferiority hypothesis, the lower bound of the one-sided 97.5% confidence interval for the odds ratio (OR) of the primary outcome (mRS 0-2 at 90 days) with Direct MT group as compared with Bridging group needed to exceed 0.74.
Safety outcomes

✓ Safety

1. Any ICH within 36 h
2. Symptomatic ICH within 36 h

(NINDS criteria, SITS-MOST criteria)
RESULTS
The flowchart of Enrollment and Randomization

204 patients were enrolled

101 were assigned to the Direct MT group
- 4 were excluded
  - 4 had a protocol violation
- 97 were included in the per-protocol analysis

103 were assigned to the Bridging group
- 6 were excluded
  - 6 had a protocol violation
- 97 were included in the per-protocol analysis

All patients were followed for 90 days.
## Baseline Characteristics

<table>
<thead>
<tr>
<th></th>
<th>Direct MT group</th>
<th>Bridging group</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n=101</td>
<td>n=103</td>
<td></td>
</tr>
<tr>
<td>Age, y median (IQR)</td>
<td>74 [67-80]</td>
<td>76 [67-80]</td>
<td>0.79</td>
</tr>
<tr>
<td>Male gender, no. (%)</td>
<td>56(55)</td>
<td>72(70)</td>
<td>0.04</td>
</tr>
<tr>
<td>Weight, Kg median (IQR)</td>
<td>59 [52-66]</td>
<td>60 [53-68]</td>
<td>0.43</td>
</tr>
<tr>
<td><strong>Medical history</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypertension, no. (%)</td>
<td>61(60)</td>
<td>61(59)</td>
<td>0.89</td>
</tr>
<tr>
<td>Dyslipidemia, no. (%)</td>
<td>30(30)</td>
<td>37(36)</td>
<td>0.37</td>
</tr>
<tr>
<td>Diabetes mellitus, no. (%)</td>
<td>16(16)</td>
<td>17(17)</td>
<td>1</td>
</tr>
<tr>
<td>Atrial fibrillation, no. (%)</td>
<td>57(56)</td>
<td>64(62)</td>
<td>0.48</td>
</tr>
<tr>
<td>Smoking, no. (%)</td>
<td>42(42)</td>
<td>54(52)</td>
<td>0.13</td>
</tr>
<tr>
<td>Past Stroke, no. (%)</td>
<td>12(12)</td>
<td>14(14)</td>
<td>0.83</td>
</tr>
<tr>
<td>Past CHD, no. (%)</td>
<td>7(7)</td>
<td>7(7)</td>
<td>1</td>
</tr>
<tr>
<td>Anti Platelet agent, no. (%)</td>
<td>16(16)</td>
<td>18(17)</td>
<td>0.85</td>
</tr>
<tr>
<td>Anti Coagulant agent, no. (%)</td>
<td>19(19)</td>
<td>17(17)</td>
<td>0.72</td>
</tr>
<tr>
<td>Blood sugar at admission, mg/dl</td>
<td>135 ± 48</td>
<td>135 ± 52</td>
<td>0.91</td>
</tr>
</tbody>
</table>
## Baseline Characteristics

<table>
<thead>
<tr>
<th></th>
<th>Direct MT group n=101</th>
<th>Bridging group n=103</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TOAST Classification</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Large artery (atherosclerosis), no. (%)</td>
<td>21(21)</td>
<td>15(15)</td>
<td>0.48</td>
</tr>
<tr>
<td>Cardioembolism, no. (%)</td>
<td>67(66)</td>
<td>72(70)</td>
<td></td>
</tr>
<tr>
<td>Other / undetermined etiology, no. (%)</td>
<td>13(13)</td>
<td>16(16)</td>
<td></td>
</tr>
<tr>
<td>SBP at admission, mmHg median (IQR)</td>
<td>158 [134-172]</td>
<td>150 [132-171]</td>
<td>0.64</td>
</tr>
<tr>
<td>DBP at admission, mmHg median (IQR)</td>
<td>83 [75-98]</td>
<td>86 [78-98]</td>
<td>0.47</td>
</tr>
<tr>
<td>NIHSS score at admission median (IQR)</td>
<td>19 [13-23]</td>
<td>17 [12-22]</td>
<td>0.46</td>
</tr>
<tr>
<td>Pre modified Rankin Scale score</td>
<td></td>
<td></td>
<td>0.77</td>
</tr>
<tr>
<td>0, no. (%)</td>
<td>84(83)</td>
<td>88(85)</td>
<td></td>
</tr>
<tr>
<td>1, no. (%)</td>
<td>11(11)</td>
<td>6(6)</td>
<td></td>
</tr>
<tr>
<td>2, no. (%)</td>
<td>6(6)</td>
<td>7(7)</td>
<td></td>
</tr>
<tr>
<td>3, no. (%)</td>
<td>0</td>
<td>2(2)</td>
<td></td>
</tr>
<tr>
<td>Onset to Door time (min)</td>
<td>92 ± 57</td>
<td>100 ± 55</td>
<td>0.34</td>
</tr>
<tr>
<td>Door to Randomization time (min)</td>
<td>36 ± 24</td>
<td>36 ± 19</td>
<td>0.88</td>
</tr>
<tr>
<td>Randomization to Puncture time (min)</td>
<td>22 ± 21</td>
<td>22 ± 16</td>
<td>0.61</td>
</tr>
</tbody>
</table>
## Baseline Characteristics

<table>
<thead>
<tr>
<th></th>
<th>Direct MT group</th>
<th>Bridging group</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Examination at admission</strong></td>
<td></td>
<td></td>
<td>0.13</td>
</tr>
<tr>
<td>MRI/MRA, no. (%)</td>
<td>86(85)</td>
<td>95(92)</td>
<td></td>
</tr>
<tr>
<td>CT/CTA, no. (%)</td>
<td>15(15)</td>
<td>8(8)</td>
<td></td>
</tr>
<tr>
<td><strong>Occluded site by MRA/CTA</strong></td>
<td></td>
<td></td>
<td>0.59</td>
</tr>
<tr>
<td>ICA, no. (%)</td>
<td>41(41)</td>
<td>36(35)</td>
<td></td>
</tr>
<tr>
<td>M1 proximal, no. (%)</td>
<td>19(19)</td>
<td>18(17)</td>
<td></td>
</tr>
<tr>
<td>M1 distal, no. (%)</td>
<td>41(41)</td>
<td>49(48)</td>
<td></td>
</tr>
<tr>
<td><strong>Occluded site by angiogram</strong></td>
<td></td>
<td></td>
<td>0.41</td>
</tr>
<tr>
<td>None, no. (%)</td>
<td>1(1)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>ICA origin, no. (%)</td>
<td>13(13)</td>
<td>16(16)</td>
<td></td>
</tr>
<tr>
<td>ICA C4-5, no. (%)</td>
<td>6(6)</td>
<td>6(6)</td>
<td></td>
</tr>
<tr>
<td>ICA C1-3, no. (%)</td>
<td>17(17)</td>
<td>14(14)</td>
<td></td>
</tr>
<tr>
<td>M1 proximal, no. (%)</td>
<td>10(10)</td>
<td>12(12)</td>
<td></td>
</tr>
<tr>
<td>M1 distal, no. (%)</td>
<td>44(44)</td>
<td>35(34)</td>
<td></td>
</tr>
<tr>
<td>M2, no. (%)</td>
<td>10(10)</td>
<td>20(19)</td>
<td></td>
</tr>
<tr>
<td><strong>ASPECTS</strong></td>
<td>7 [6-9]</td>
<td>8 [6-9]</td>
<td>0.86</td>
</tr>
</tbody>
</table>
MAIN RESULT
mRS at 90 days

Direct MT group
N=101

Bridging group
N=103
mRS at 90 days

Direct MT group
N=101

Bridging group
N=103

mRS0-2: 59.4%
P=0.78

mRS0-2: 57.3%
P=1.00

mRS6: 7.9%

mRS6: 8.7%
Primary efficacy outcome: mRS0-2

Primary: mRS0-2 (ITT)

Direct MT therapy (vs. Bridging therapy)

Primary outcome: unadjusted logistic regression model (ITT)

odds ratio 1.09, 95% CI 0.63 - 1.90, p=0.17 for noninferiority.
Secondary efficacy outcome: mRS

Direct MT therapy (vs. Bridging therapy)

Primary: mRS0-2 (ITT)

Secondary: mRS shift analysis(ITT)

Primary outcome: odds ratio 1.09, 95% CI 0.63 - 1.90, p=0.17 for noninferiority.

Secondary outcome: Shift analysis(ITT)
odds ratio 0.97, 95% CI 0.60 - 1.56, p=0.27 for noninferiority.
Secondary efficacy outcome: mRS 0-2

Direct MT therapy (vs. Bridging therapy)

Primary: mRS0-2 (ITT)

Secondary: mRS shift analysis (ITT)

Secondary: mRS0-2 (PPT)

Primary outcome: odds ratio 1.09, 95% CI 0.63 - 1.90, p=0.17 for noninferiority.

Secondary outcome: odds ratio 0.97, 95% CI 0.60 - 1.56, p=0.27 for noninferiority.

Secondary efficacy outcome: unadjusted logistic regression model (PPT)

odds ratio 1.06, 95% CI 0.60 - 1.88, p=0.22 for noninferiority.
Efficacy outcome

**Primary outcome:**
- Odds ratio 1.09, 95% CI 0.63 - 1.90, p=0.17 for noninferiority.

**Secondary outcomes:**
1. **Primary: mRS0-2 (ITT)**
   - Odds ratio 0.97, 95% CI 0.60 - 1.56, p=0.27 for noninferiority.

2. **Secondary: mRS shift analysis (ITT)**
   - Odds ratio 1.06, 95% CI 0.60 - 1.88, p=0.22 for noninferiority.

We could not prove non-inferiority of Direct MT to Bridging therapy.
### Secondary efficacy outcomes

<table>
<thead>
<tr>
<th></th>
<th>Direct MT group</th>
<th>Bridging group</th>
<th>HR(95%CI)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>n=101</td>
<td>n=103</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Death at 90 days, no. (%)</td>
<td>8(8)</td>
<td>9(9)</td>
<td>0.90(0.33-2.43)</td>
<td>1.00</td>
</tr>
<tr>
<td>Puncture to Reperfusion time (min)</td>
<td>50 ± 37</td>
<td>42 ± 33</td>
<td></td>
<td>0.12</td>
</tr>
<tr>
<td>TICI grade ≥ 2B, no. (%)</td>
<td>91(90)</td>
<td>95(92)</td>
<td>0.89(0.51-1.55)</td>
<td>0.78</td>
</tr>
</tbody>
</table>

The recanalization rate were quite high (HERMES collaboration: 70.5%)
## Safety outcomes

<table>
<thead>
<tr>
<th></th>
<th>Direct MT group</th>
<th>Bridging group</th>
<th>HR(95%CI)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>n=101</td>
<td>n=103</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any ICH at 36h</td>
<td>34(34)</td>
<td>52(50)</td>
<td>0.50(0.28-0.88)</td>
<td>0.02</td>
</tr>
<tr>
<td>Symptomatic ICH (NINDS criteria) at 36h</td>
<td>8(8)</td>
<td>12(12)</td>
<td>0.65(0.25-1.67)</td>
<td>0.48</td>
</tr>
<tr>
<td>Symptomatic ICH (SIT-MOST criteria) at 36h</td>
<td>6(6)</td>
<td>8(8)</td>
<td>0.75(0.25-2.24)</td>
<td>0.78</td>
</tr>
</tbody>
</table>

Any ICH was significantly lower in the Direct MT group.
Primary efficacy outcome according to subgroups

<table>
<thead>
<tr>
<th></th>
<th>Direct group</th>
<th>Bridging group</th>
<th>mRS0-2 at 90 days</th>
<th>Odds Ratio (95% CI)</th>
<th>P Value for Interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;70 years</td>
<td>24(72.3)</td>
<td>21(63.6)</td>
<td></td>
<td>1.52(0.54-4.33)</td>
<td>0.45</td>
</tr>
<tr>
<td>≥70 years</td>
<td>36(52.9)</td>
<td>38(54.3)</td>
<td></td>
<td>0.95(0.49-1.85)</td>
<td></td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>33(58.9)</td>
<td>43(59.7)</td>
<td></td>
<td>0.97(0.48-1.97)</td>
<td>0.53</td>
</tr>
<tr>
<td>Female</td>
<td>27(60.0)</td>
<td>16(51.6)</td>
<td></td>
<td>1.41(0.56-3.54)</td>
<td></td>
</tr>
<tr>
<td><strong>AF</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>YES</td>
<td>36(63.2)</td>
<td>35(54.7)</td>
<td></td>
<td>1.42(0.68-2.95)</td>
<td>0.27</td>
</tr>
<tr>
<td>NO</td>
<td>24(54.6)</td>
<td>24(61.5)</td>
<td></td>
<td>0.75(0.31-1.80)</td>
<td></td>
</tr>
<tr>
<td><strong>Blood Sugar</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;126 mg/dl</td>
<td>40(65.6)</td>
<td>36(59.0)</td>
<td></td>
<td>1.32(0.63-2.76)</td>
<td>0.42</td>
</tr>
<tr>
<td>≥126 mg/dl</td>
<td>20(50.0)</td>
<td>23(54.8)</td>
<td></td>
<td>0.83(0.35-1.97)</td>
<td></td>
</tr>
<tr>
<td><strong>Use of antithrombotic agent</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>YES</td>
<td>16(47.1)</td>
<td>18(56.3)</td>
<td></td>
<td>0.69(0.26-1.82)</td>
<td>0.25</td>
</tr>
<tr>
<td>NO</td>
<td>44(65.7)</td>
<td>41(57.8)</td>
<td></td>
<td>1.40(0.70-2.79)</td>
<td></td>
</tr>
<tr>
<td><strong>NIHSS score at admission</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;18</td>
<td>30(73.2)</td>
<td>37(69.8)</td>
<td></td>
<td>1.18(0.48-2.92)</td>
<td>0.90</td>
</tr>
<tr>
<td>≥18</td>
<td>30(50.0)</td>
<td>22(44.0)</td>
<td></td>
<td>1.27(0.60-2.70)</td>
<td></td>
</tr>
<tr>
<td><strong>ASPECTS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;8</td>
<td>30(56.6)</td>
<td>20(46.5)</td>
<td></td>
<td>1.50(0.67-3.37)</td>
<td>0.37</td>
</tr>
<tr>
<td>≥8</td>
<td>30(62.5)</td>
<td>39(65.0)</td>
<td></td>
<td>0.90(0.41-1.98)</td>
<td></td>
</tr>
<tr>
<td><strong>Occluded artery</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICA</td>
<td>21(51.2)</td>
<td>19(52.8)</td>
<td></td>
<td>0.94(0.38-2.30)</td>
<td>0.99</td>
</tr>
<tr>
<td>M1 proximal</td>
<td>11(57.9)</td>
<td>9(50.0)</td>
<td></td>
<td>1.38(0.38-5.03)</td>
<td></td>
</tr>
<tr>
<td>M1 distal</td>
<td>28(68.3)</td>
<td>31(63.3)</td>
<td></td>
<td>1.25(0.52-3.01)</td>
<td></td>
</tr>
<tr>
<td><strong>Onset to Randomization</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤120 min</td>
<td>34(63.0)</td>
<td>31(68.9)</td>
<td></td>
<td>0.77(0.33-1.78)</td>
<td>0.35</td>
</tr>
<tr>
<td>&gt;120 min</td>
<td>26(55.3)</td>
<td>28(48.3)</td>
<td></td>
<td>1.33(0.61-2.87)</td>
<td></td>
</tr>
</tbody>
</table>
Summary of Results

**mRS 0-2 at 90days**
- Direct MT group: 60%
- Bridging group: 60%
  - P=0.78
  - P=0.17 (Noninferiority)

**Any ICH within 36 h**
- Direct MT group: 20%
- Bridging group: 50%
  - P=0.02
Limitations

1. Open labeled treatment

2. Limited to patients with ICA or M1 occlusion

3. Dosage of alteplase was only 0.6 mg/kg
We could not prove inferiority?

Frequency of favorable outcome due to high recanalization rate was higher than we expected, which could not statistically prove non-inferiority.
Conclusions

- Frequency of favorable outcomes did not differ between Direct MT group and Bridging group, however, we could not prove non-inferiority of Direct MT therapy to Bridging therapy.

- Any ICH was significantly less frequent in Direct MT group than in Bridging group.
Committees

- **Principal Investigator**
  Kazumi Kimura
  Yuji Matsumaru

- **Protocol Authoring Committee**
  Kentaro Suzuki

- **Radiological Judging Committee**
  Teruyuki Hirano
  Shigeru Fujimoto

- **Steering Committee**
  Yasuyuki Iguchi
  Keigo Shigeta
  Seiji Okubo
  Masataka Takeuchi
  Masafumi Morimoto
  Ryuzaburo Kanazawa
  Yuki Kamiya
  Norihiro Ishii
  Yorio Koguchi
  Hiromichi Naito
  Masato Inoue
  Toshihiro Ueda
  Noriyuki Kato

- **Independent Data Monitoring Committee**
  Akio Morita

- **Event Evaluation Committee**
  Hiroyuki Yokota

- **Statistical Analysis Committee**
  Toshiaki Otsuka
  Kazumi Kimura
  Yasuhiro Nishiyama
  Kentaro Suzuki
Clinical Sites by Enrollment

Nippon Medical School Hospital
University of Tsukuba
Seishou Hospital
Yokohama Shintoshi Neurosurgery Hospital
Nagareyama Central Hospital
Akiyama Neurosurgical Hospital
Showa University Koto Toyoosu Hospital
National Hospital Organization Disaster Medical Center
New Tokyo Hospital
Chiba Emergency Medical Center
NTT Medical Center Tokyo
National Center For Global Health and Medicine
Dokkyo Medical University Koshigaya Hospital
Metropolitan Tama Medical Center
Funabashi Municipal Medical Center
Mihara Memorial Hospital
Mito Medical Center
Kyorin University
St. Marianna University Toyoko Stroke Center
The Jikei University School of Medicine
Tokyo Medical And Dental University
Jichi Medical University Hospital
Toranomon Hospital
See You at Tokyo Olympic From Jan.24 – Aug.9.2020
Thank You

Grazie

شكرًا

Terima kasih

Obrigado

Gracias

Hvala ti

Teşekkür ederiz

Diolch Aitäh

Asante

ありがとう

ขอบคุณ

Ευχαριστούμε

Děkuju

ขอบคุณ

Salamat Je vous remercie

Danke remercie Je vous remercie

متشکرم

Dank u

תודה