

# CASE BASED DISCUSSIONS

## STROKE WITH TANDEM LESIONS

Ajay Kumar

Professor

Subdiv. of Neuroradiology and Neurointerventions

Department of Radiodiagnosis and Imaging

PGIMER Chandigarh India

# DISCLOSURE STATEMENT OF FINANCIAL INTEREST

Within the past 12 months, I or my spouse/partner have had a financial interest/arrangement or affiliation with the organization(s) listed below

NONE

# DISCLOSURE STATEMENT OF FINANCIAL INTEREST

I, (AJAY KUMAR) 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.

# CASE

- 55 / M
- Presented with sudden slurring of speech – 4.5 hrs
- Progressive right hemiparesis with RUL & LL 2/5 - 4.5 hrS
- ASPECTS – 7
- NIHSS-22
- Non smoker
- No Known DM or HTN
- CTA outside – Non visualized LT distal ICA & MCA with significant ICA origin Narrowing



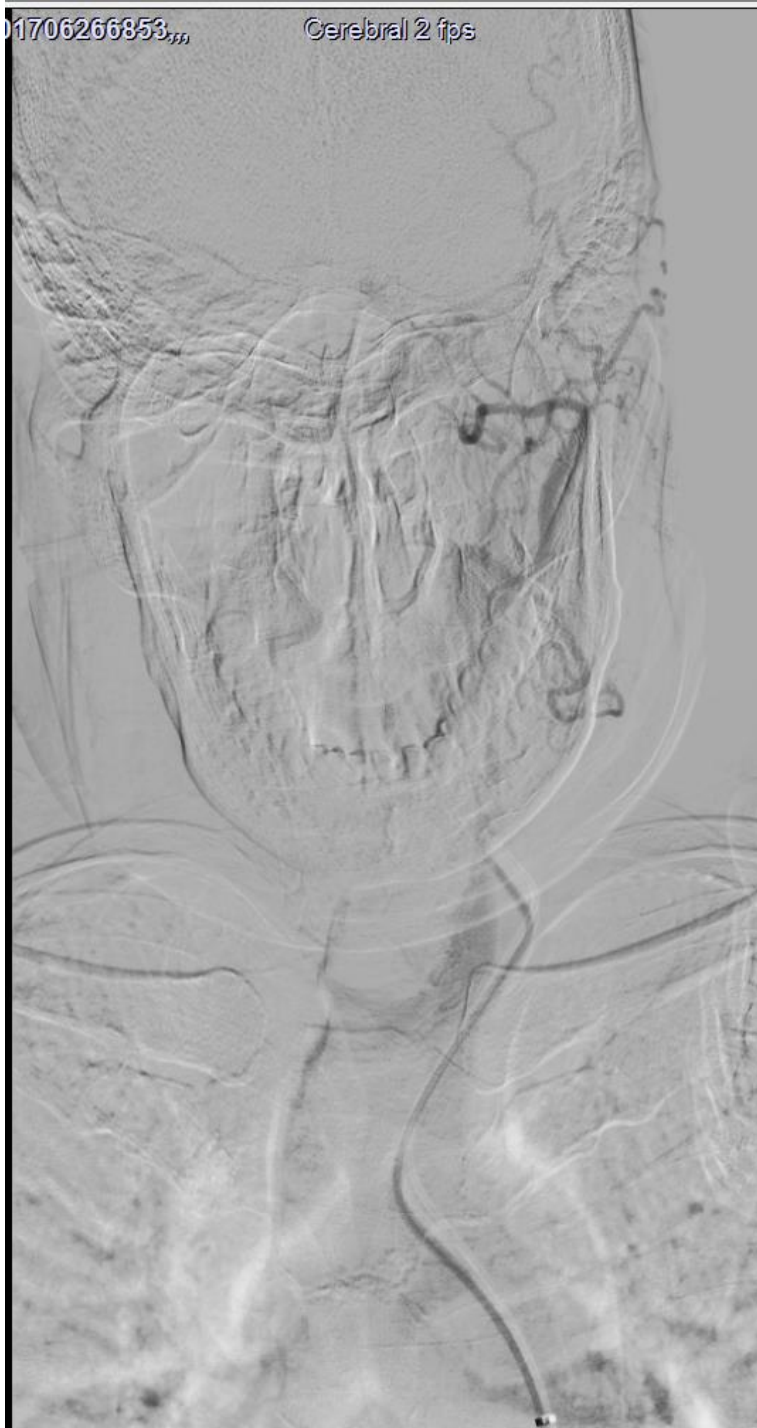
01706266853

Cerebral 2 fps



01706266853,,,

Cerebral 2 fps



# Case

## Options

- Deal with neck first or head first ? ? ?



# Case

## NECK FIRST- stenting / angioplasty

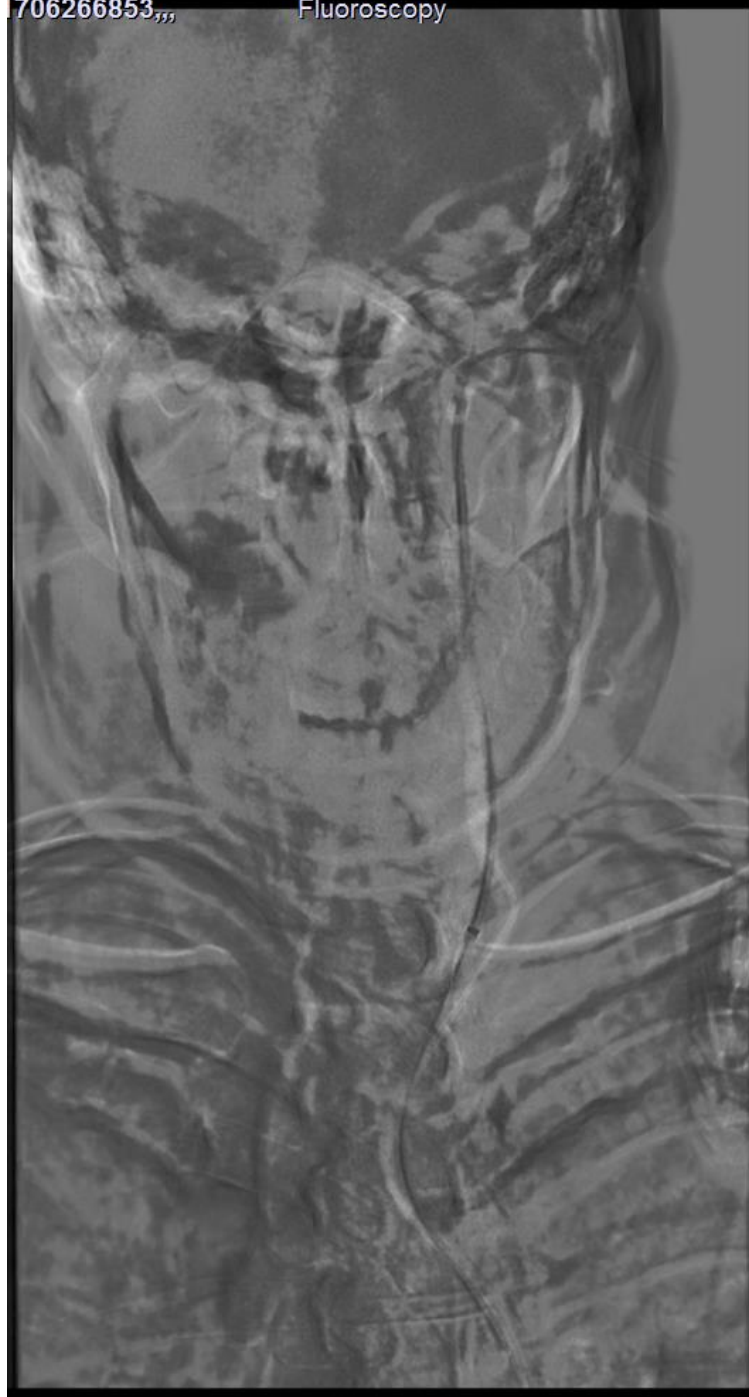
- Better reperfusion or flow augmentation
- Recanalization of flow related intracranial occlusions
- Ease of further intracranial MT for single or multiple required passes
- Delay of IC reperf by 15 to 20 min
- Increase risk of reperf hemorrhage and stent thrombosis

## HEAD FIRST

- Shorter /earlier reperfusion
- Better outcomes







125112

Study  
Stu



125112

Study  
Stu





125112

Study  
Stu



125112

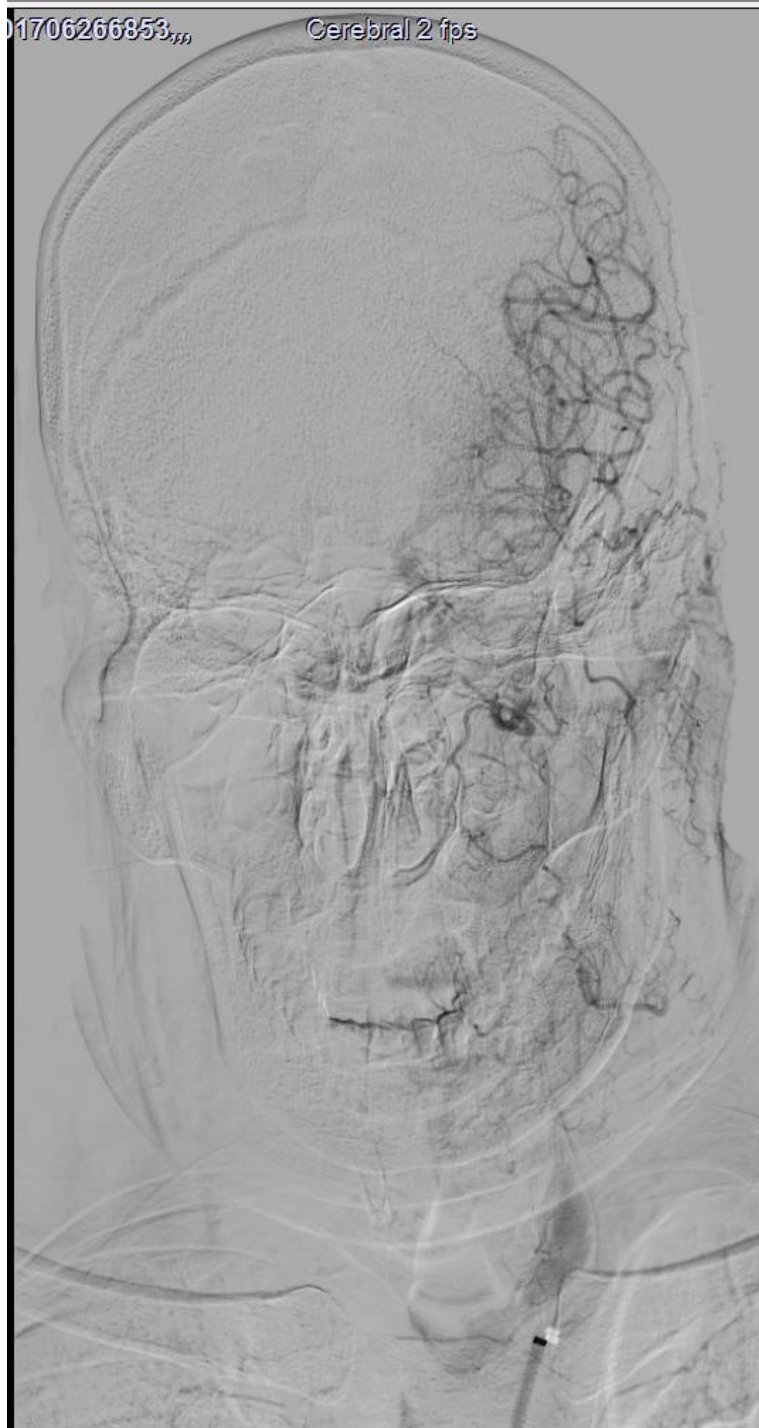
Study  
Stu

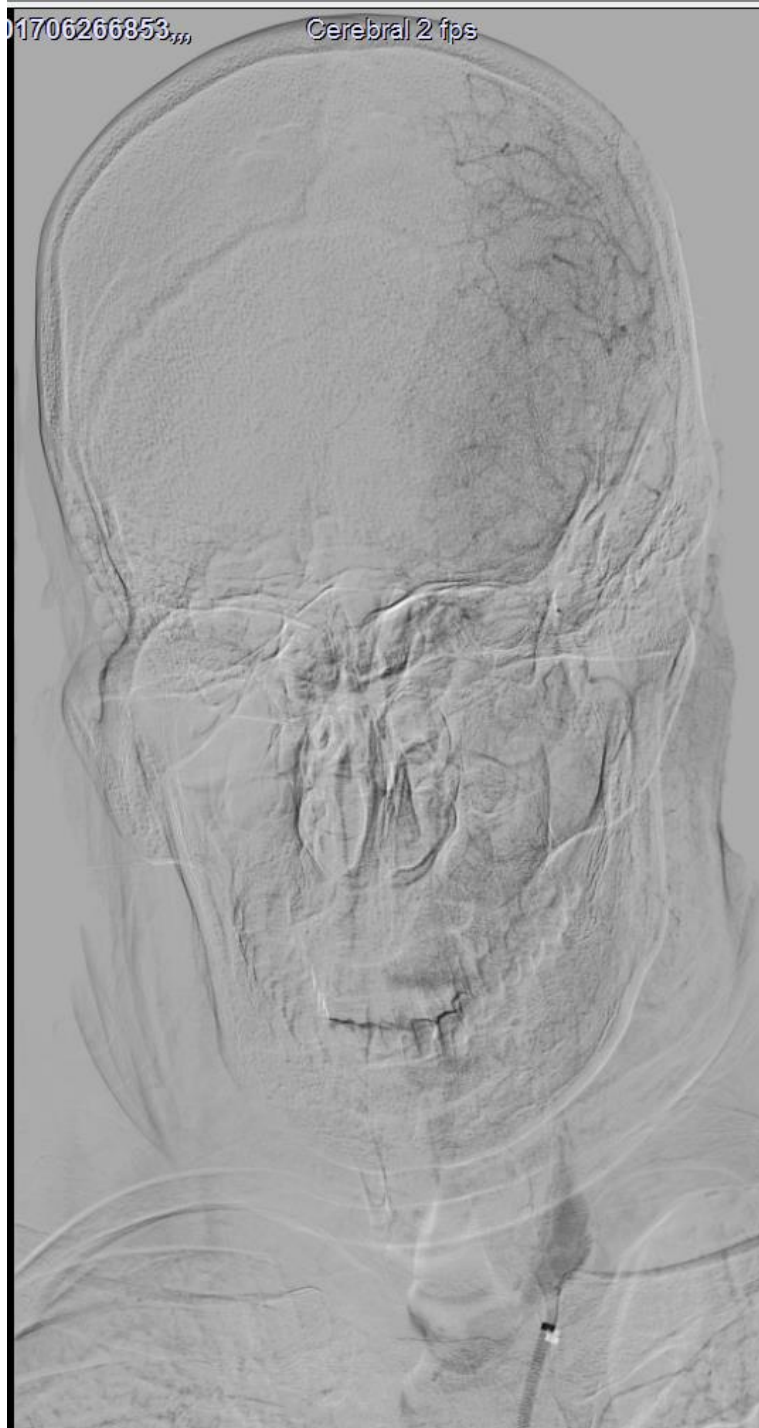














# Case

## Options

- Deal with neck now

OR

- Check for collateral status ( Acom , Pcom & Pial)

- Than decide for Acute stenting

Risk of reperf hemorrhage --18-43 %

Risk of Stent thrombosis --- 17%

Dependency on dual antiplatelets with increase risk /extent of reperf hemorrhage

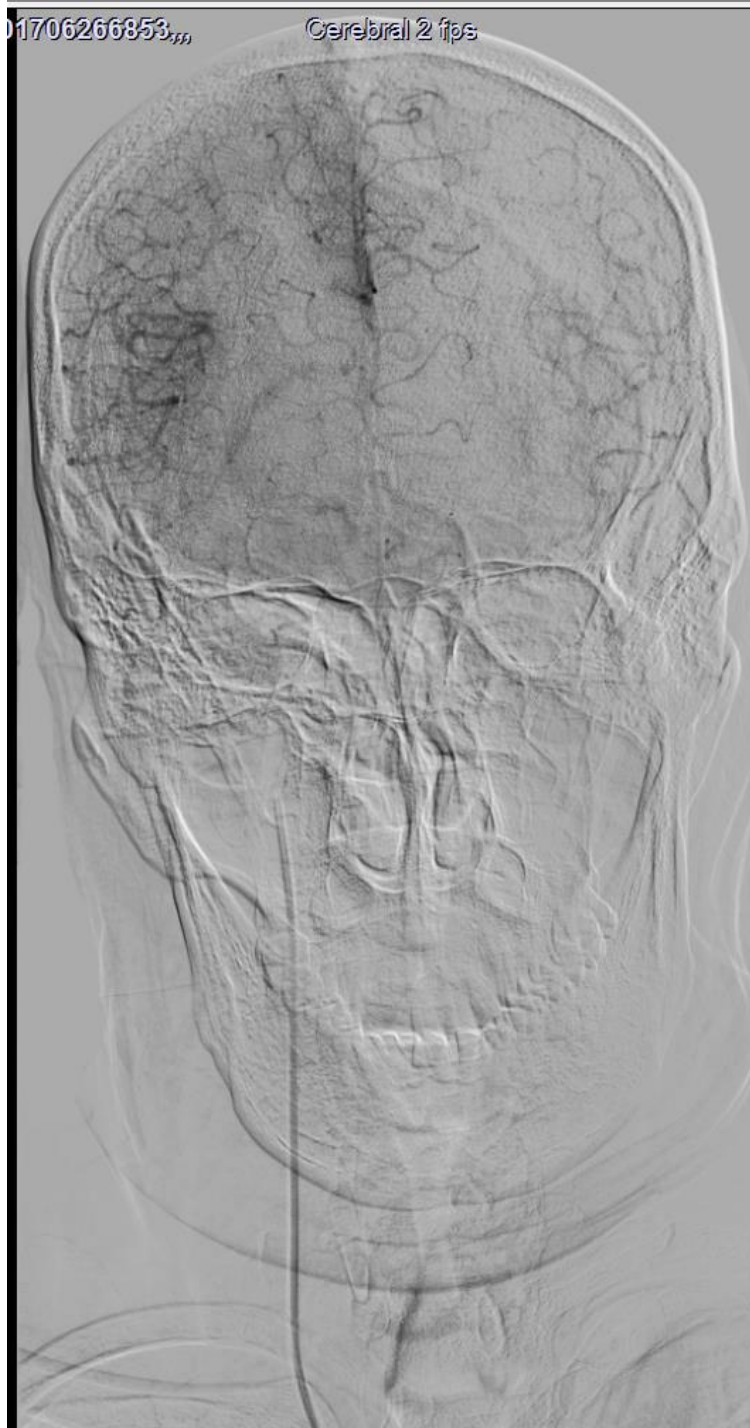




























# Case

## Decision

- Good collateralization through Acom ,Pcom & Pial ACA and PCA circulation
- Adequate on table clinical recovery with significant improvement in upper and lower limb powers
- Interval stenting for carotid lesion
- Patient on three months FU completely recovered ,doing all daily activities
- Planned for elective carotid stenting
- Recent FU CTA Mid Feb 19

Oblique  
Ex: 5823

ADVANCED TRAUMA CENTER, PGI CHD

T-8600/19

66

M

Ex: Feb 21 2019

Se:3  
P: 15.20 (col)

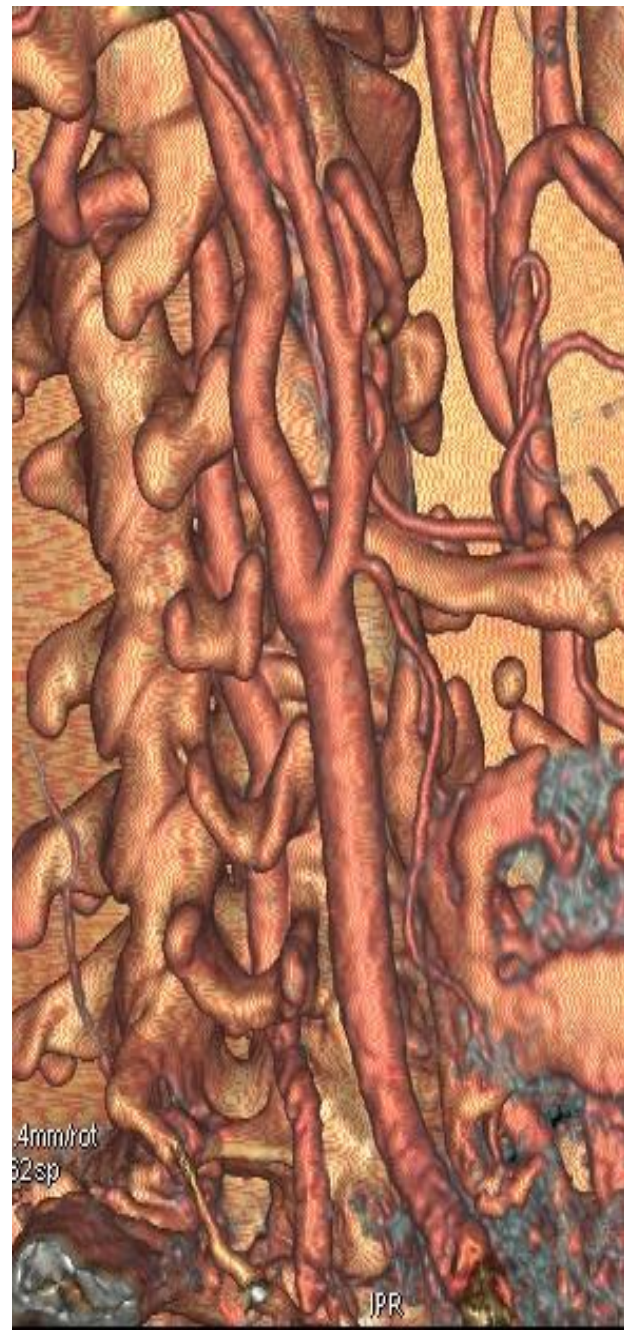
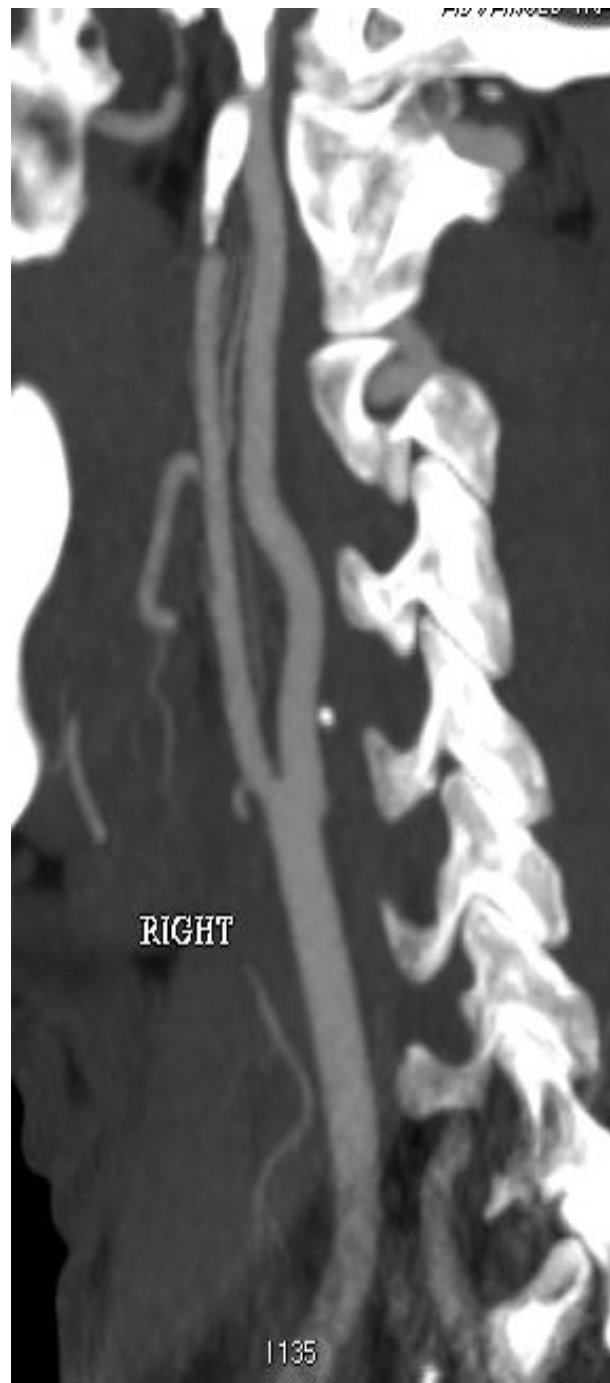
DFOV 13.0cm  
STND/M

R  
A  
I

L  
P  
S

MP  
18.7  
KV 120  
mA Mod.  
Rot 0.40s/HE+ 39.4mm/rot  
0.6mm 0.984:1 /0.62sp  
Tilt: 0.0  
10:37:33 AM

ILP



LEFT

1141

LEFT

IPL



Ex: 5823

T-8600/19

66

M

Ex: Feb 21 2019

Se: 3

S: 18.50

Im: 399

DFOV 13.0cm

STND/I

R

6

5

L

7

1

MIP

3.1

kV: 120

mA: 299

Rot: 0.40s/HE+ 39.4mm/rot

0.6mm 0.984:1/0.62sp

Tilt: 0.0

10:37:33 AM

Ex: 3823

1-8800/19

66

M

Ex: Feb 21 2019

Se: 3

S: 39.75

Im: 433

DFOV 13.0cm

STND/I

R

6

5

L

7

1

MIP

27.5

kV 120

mA 299

Rot 0.40s/HE+ 39.4mm/rot

0.6mm 0.984;1/0.62sp

Tilt: 0.0

10:37:33 AM



Axial  
Ex: 5823

ADVANCED TRAUMA CENTER, PGICHD

T-8600/19

66

M

Ex: Feb 21 2019

Se:3  
S: 52.88  
Im: 454  
DFOV 14.7cm  
STND/I

R  
7  
7

L  
7  
7

MIP  
27.5  
KV 120  
mA 299  
Rot 0.40s/HE+ 39.4mm/rot  
0.6mm 0.984:1/0.62sp  
Tilt: 0.0  
10:37:33 AM

Coronal  
Ex: 5823

ADVANCED TRAUMA CENTER, PGI CHD

T-8600/19

66

M

Ex: Feb 21 2019

Se: 3  
A: 24.06

DFOV 13.0cm  
STND1

R  
6  
5

L  
7  
1

MP  
25.0  
kV 120  
mA Mod.  
Rot 0.40s / HE 30 Amm/rot  
0.6mm 0.984:1 / 0.82sp  
Tilt: 0.0  
103733 AM

Sagittal  
Ex: 5623

ADVANCED TRAUMA CENTER, PCHD  
T-880019

66  
M

Ex: Feb 21 2019

Sa: 3  
R: 29.07

DFOV 13.0cm  
STND

A  
5  
3

P  
8  
4

RIGHT

MP  
20.2  
kV 120  
mA 100  
Rot 0.40s/HE- 30.4mm/rot  
0.6mm 0.0041/0.02sp  
Tilt: 0.0  
10:37:33 AM

Sagittal  
Ex: 5623

ADVANCED TRAUMA CENTER, PGI CHD  
T-8600/19  
66  
M  
Ex: Feb 21 2019

Sr: 3  
L: 30.18

DFOV: 13.0cm  
STDH

A  
5  
3

P  
8  
4

LEFT

MIP  
20.2  
kV: 120  
mA: Wbd.  
Rot: 0.40s/HE: 39.4mm/rot  
0.6mm 0.8841/0.62sp  
Tilt: 0.0  
10:37:33 AM

Oblique  
Ex: 5623

ADVANCED TRAUMA CENTER, PC/CHD

T-880019

36

M

Ex: Feb 21 2019

Se: 3  
Pr: 10.11 (coi)

DFOV: 13.0cm  
STDW

R  
A  
S

L  
P  
I

MP  
26.9  
KV 120  
mA Mod.  
Rot 0.40s/HE+ 39.4mm/rot  
0.6mm 0.984:1/0.62sp  
Tilt: 0.0  
10:37:33 AM

192

Se: 2  
Im: 7

Feb 21 2019  
10:34:55 AM

R  
1  
2  
5

L  
1  
2  
5





Se: 2  
Im: 8

Feb 21 2019  
10:34:55 AM

R  
1  
2  
5

L  
1  
2  
5



Se: 2  
Im: 9

Feb 21 2019  
10:34:55 AM

R  
1  
2  
5

L  
1  
2  
5



Se: 2  
Im: 10

Feb 21 2019  
10:34:55 AM

R  
1  
2  
5

L  
1  
2  
5



Se: 2  
Im: 11

Feb 21 2019  
10:34:55 AM

R  
1  
2  
5

L  
1  
2  
5



Se: 2  
Im: 12

Feb 21 2019  
10:34:55 AM

R  
1  
2  
5

L  
1  
2  
5



Se: 2  
Im: 13

Feb 21 2019  
10:34:55 AM

R  
1  
2  
5

L  
1  
2  
5





Se: 2  
Im: 14

Feb 21 2019  
10:34:55 AM

R  
1  
2  
5

L  
1  
2  
5



Se: 2  
Im: 15

Feb 21 2019  
10:34:55 AM

R  
1  
2  
5



L  
1  
2  
5

SC: 2  
Im: 16

Feb 21 2019  
10:34:55 AM

R  
1  
2  
5



L  
1  
2  
5

Se: 2  
Im: 17

Feb 21 2019  
10:34:55 AM

R  
1  
2  
5



L  
1  
2  
5

Se: 2  
Im: 18

Feb 21 2019  
10:34:55 AM

R  
1  
2  
5



L  
1  
2  
5

Se: 2  
Im: 19

Feb 21 2019  
10:34:55 AM

R  
1  
2  
5

L  
1  
2  
5





Se: 2  
Im: 20

Feb 21 2019  
10:34:55 AM

R  
1  
2  
5

L  
1  
2  
5



Se: 2  
Im: 21

Feb 21 2019  
10:34:55 AM

R  
1  
2  
5

L  
1  
2  
5



Im: 23

Feb 21 2019  
10:34:55 AM

R  
1  
2  
5

L  
1  
2  
5



## Original Paper

# Head or Neck First? Speed and Rates of Reperfusion in Thrombectomy for Tandem Large Vessel Occlusion Strokes

Diogo C. Haussen<sup>a</sup> Francis Turjman<sup>b</sup> Michel Piotin<sup>c</sup> Julien Labreuche<sup>d</sup>  
 Henrik Steglich-Arnholm<sup>e</sup> Markus Holmannspötter<sup>f</sup> Christian Taschner<sup>g</sup>  
 Sebastian Eiden<sup>h</sup> Raul G. Nogueira<sup>a</sup> Panagiotis Papanagiotou<sup>h</sup> Maria Boutchakova<sup>h</sup>  
 Adnan H. Siddiqui<sup>i</sup> Bertrand Laperque<sup>j</sup> Franziska Dorn<sup>k</sup> Christophe Cognard<sup>l</sup>  
 Monika Killer<sup>m</sup> Salvatore Mangiafico<sup>n</sup> Marc Ribo<sup>o</sup> Marios N. Psychogios<sup>p</sup>  
 Alejandro M. Spiotta<sup>q</sup> Marc-Antoine Labeyrie<sup>r</sup> Mikael Mazighi<sup>c, s, w</sup>  
 Alessandra Biondi<sup>x</sup> Sébastien Richard<sup>t, v</sup> Jonathan A. Grossberg<sup>a</sup>  
 René Anxionnat<sup>x, y</sup> Serge Bracard<sup>x, y</sup> Benjamin Gory<sup>x, y</sup>

on behalf of the TITAN (Thrombectomy In TANdem Lesions) Investigators

<sup>a</sup>Department of Neurology, Emory University/Grady Memorial Hospital, Atlanta, GA, USA;

<sup>b</sup>Department of Interventional Neuroradiology, Hospices Civils, Lyon, France; <sup>c</sup>Department of Interventional Neuroradiology, Hôpital de la Fondation Ophtalmologique Adolphe de Rothschild, Paris, France; <sup>d</sup>Department of Biostatistics, University of Lille, CHU Lille, EA 2694-Santé Publique: Épidémiologie et Qualité des Soins, Lille, France; <sup>e</sup>Department of Neurology, Rigshospitalet, Copenhagen, Denmark; <sup>f</sup>Department of Neuroradiology, Rigshospitalet, Copenhagen, Denmark;

<sup>g</sup>Department of Neuroradiology, Medical Center, University of Freiburg, Freiburg, Germany; <sup>h</sup>Diagnostic and Interventional Neuroradiology, Hospital Bremen-Mitte/Bremen-Ost, Bremen, Germany; <sup>i</sup>Department of Neurosurgery, State University of New York, Buffalo, NY, USA;

<sup>j</sup>Department of Neurology, Stroke Center, Foch Hospital, Suresnes, France; <sup>k</sup>Department of Neuroradiology, University Hospital of Munich, Munich, Germany; <sup>l</sup>Department of Neuroradiology, University Hospital of Toulouse, Toulouse, France; <sup>m</sup>Department of Neuroradiology, Paracelsus Medical University Salzburg, Salzburg, Austria; <sup>n</sup>Department of Interventional Neuroradiology, Careggi University Hospital, Florence, Italy; <sup>o</sup>Department of Neurology, Hospital Vall D'Hebron, Barcelona, Spain; <sup>p</sup>Department of Neuroradiology, University Medical Center Göttingen, Göttingen, Germany; <sup>q</sup>Department of Neurosurgery, Medical University of South Carolina, Charleston, SC, USA; <sup>r</sup>Department of Interventional Neuroradiology, Lariboisière Hospital, Paris, France; <sup>s</sup>Department of Neuroradiology and Endovascular Therapeutic, University Hospital of Besançon, Besançon, France; <sup>t</sup>Stroke Unit, Department of Neurology, University Hospital of Nancy, Nancy, France; <sup>u</sup>Centre d'Investigation Clinique Plurithématique, INSERM U1116, Nancy, France; <sup>v</sup>INSERM U1148, Paris, France; <sup>w</sup>Paris Denis Diderot University, Paris, France; <sup>x</sup>Department of Diagnostic and Therapeutic Neuroradiology, University Hospital of Nancy, Nancy, France;

<sup>y</sup>University of Lorraine, INSERM U1254, Nancy, France





## Order of Treatment Matters in Ischemic Stroke: Mechanical Thrombectomy First, Then Carotid Artery Stenting for Tandem Lesions of the Anterior Circulation

Volker Maus<sup>a</sup> Jan Borggrefe<sup>b</sup> Daniel Behme<sup>a</sup> Christoph Kabbasch<sup>b</sup>  
Nuran Abdullayev<sup>b</sup> Utako Birgit Barnikol<sup>c</sup> Leonard Leong Litt Yeo<sup>d,e</sup>  
Patrick A. Brouwer<sup>d</sup> Michael Söderman<sup>d</sup> Markus Möhlenbruch<sup>f</sup>  
Thomas Liebig<sup>g</sup> Gereon Rudolf Fink<sup>h,i</sup> Anastasios Mpotsaris<sup>j</sup>

<sup>a</sup>Department of Neuroradiology, University Medical Center Göttingen, Göttingen, Germany; <sup>b</sup>Department of Neuroradiology, University Hospital Cologne, Cologne, Germany; <sup>c</sup>Department of Child and Adolescence Psychiatry, Research Unit Ethics and University Hospital Cologne, Cologne, Germany; <sup>d</sup>Department of Clinical Neuroscience, Karolinska Institutet and Department of Neuroradiology, Karolinska University Hospital, Stockholm, Sweden; <sup>e</sup>Department of Medicine, Division of Neurology, National University Health System, Singapore, Singapore; <sup>f</sup>Department of Neuroradiology, University Hospital Heidelberg, Heidelberg, Germany; <sup>g</sup>Department of Neuroradiology, LMU Munich, Munich, Germany; <sup>h</sup>Department of Neurology, University Hospital Cologne, Cologne, Germany; <sup>i</sup>Cognitive Neuroscience, Institute of Neuroscience and Medicine (INM-3), Research Centre Jülich, Jülich, Germany; <sup>j</sup>Department of Neuroradiology, University Hospital of Aachen, Aachen, Germany

### Keywords

Ischemic stroke · Mechanical thrombectomy · Tandem lesions · Treatment order · Carotid artery stenting

### Abstract

**Background:** One endovascular treatment option of acute ischemic stroke due to tandem occlusion (TO) comprises intracranial thrombectomy and acute extracranial carotid artery stenting (CAS). In this setting, the order of treatment may impact the clinical outcome in this stroke subtype. **Methods:** Retrospective analysis was performed on data prospectively collected in 4 international stroke centers between 2013 and 2017. One hundred sixty-five patients with anterior TO were treated by endovascular therapy. Clinical

and procedural data were evaluated. Favorable clinical outcome was defined as modified Rankin Scale (mRS)  $\leq 2$  at 90 days. Propensity score matching was performed for different treatment strategies. **Results:** Patients' mean age was  $65 \pm 11$  years and 118 were male (69%). The median admission National Institutes of Health Stroke Scale was 15 (interquartile range 8). In 59% of the patients ( $n = 101$ ), the ante-grade strategy (first stenting, then thrombectomy) was performed, in 41% ( $n = 70$ ) retrograde treatment (first thrombectomy, then stenting). Successful reperfusion (mTICI  $\geq 2b$ ) was achieved in 128 patients (75%). Fifty-nine patients (39%) showed a favorable clinical outcome after 90 days. After propensity score matching, data of 100 patients could be analyzed. Analysis revealed that the retrograde strategy yielded a significantly higher rate of successful reperfusion com-



# Emergent Management of Tandem Lesions in Acute Ischemic Stroke Analysis of the STRATIS Registry

Ashutosh P. Jadhav, MD, PhD; Osama O. Zaidat, MD; David S. Liebeskind, MD;  
Dileep R. Yavagal, MD; Diogo C. Haussen, MD; Frank R. Hellinger Jr, MD, PhD;  
Reza Jahan, MD; Mouhammad A. Jumaa, MD; Viktor Szeder, MD, PhD, MS;  
Raul G. Nogueira, MD; Tudor G. Jovin, MD

**Background and Purpose**—Although intracranial thrombectomy represents the standard treatment approach for anterior circulation tandem occlusions, whether the extracranial lesion requires acute stenting remains unclear. Our aim was to investigate differences in clinical and procedural outcomes related to stenting extracranial lesions in a registry of patients undergoing thrombectomy for acute stroke.

**Methods**—Data were analyzed from the STRATIS registry (Systematic Evaluation of Patients Treated With Neurothrombectomy Devices for Acute Ischemic Stroke)—a prospective, nonrandomized study of patients undergoing neurothrombectomy with the Solitaire device. A total of 984 patients treated at 55 sites were analyzed. Univariate and multivariable logistic regression was used to assess relationship between outcome and procedural technique.

**Results**—Of 147 (14.9%) patients with tandem lesions treated, stenting of the extracranial lesion during thrombectomy was performed in 80 patients and withheld in 67 patients. There were no differences between groups with respect to age, ASPECTS (Alberta Stroke Program Early Computed Tomography Score), or intravenous-tPA (tissue-type plasminogen activator) use. However, the patients in the stenting group had lower baseline National Institutes of Health Stroke Scale (16 versus 17.9;  $P=0.07$ ), shorter onset to arterial puncture time (133.6 versus 163.4 minutes;  $P=0.04$ ), and lower rates of atrial fibrillation (6.3% versus 25.4%) as compared to the nonstenting group. Good outcomes (modified Rankin Scale, 0–2 at 90 days) were higher in the stenting group (68.5% versus 42.2%;  $P=0.003$ ) with no difference in mortality or symptomatic hemorrhage. After adjustment for covariates, stenting continued to be associated with superior outcomes.

**Conclusions**—Acute stenting of an extracranial carotid stenosis during neurothrombectomy can be achieved with equal safety compared with no stenting. Carotid stenting in the acute phase may lead to better outcomes; this should ideally be confirmed by randomized trials. (*Stroke*. 2019;50:00-00. DOI: 10.1161/STROKEAHA.118.021893.)

# Case

## STROKE WITH TANDEM CAROTID LESIONS

- IC thromectomy first than angioplasty /stenting
- Carotid stenting first than IC thrombectomy
- No acute carotid stenting – if good collaterals present
- Discussion – CONTINUES.....

ICCA STROKE 2019



Thank you all



# CASE 2

- 50 / M
- Presented with sudden transient LOC – 6 HRS
- Progressive right hemiparesis with - 6 hrS
- ASPECTS – 7
- NIHSS-20
- smoker
- No Known DM or HTN

ADVANCED TRAUMA CENTRE PGIMER

STROKE

50

F

Ex: Sep 18 2018

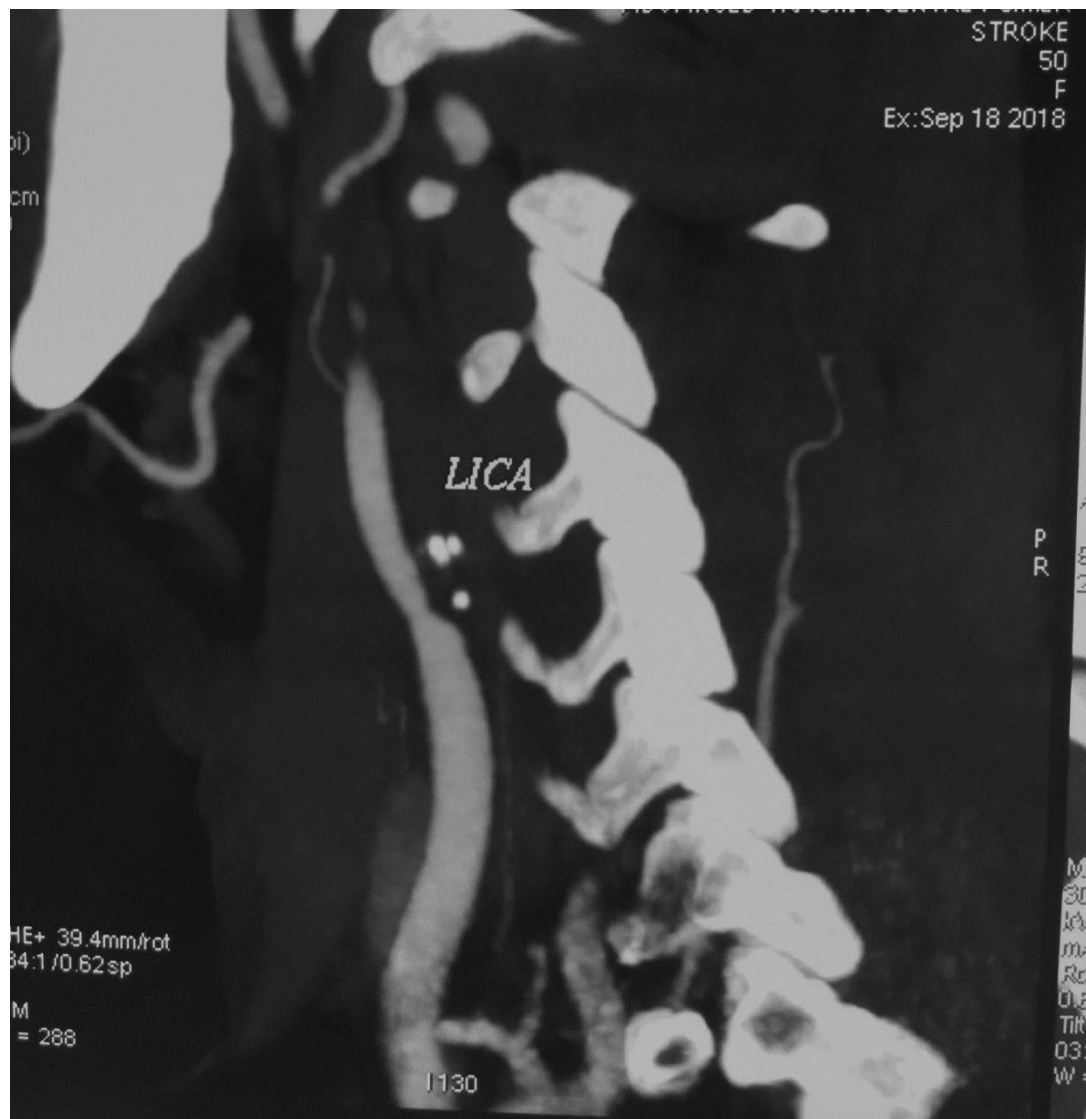
RICA

P  
R

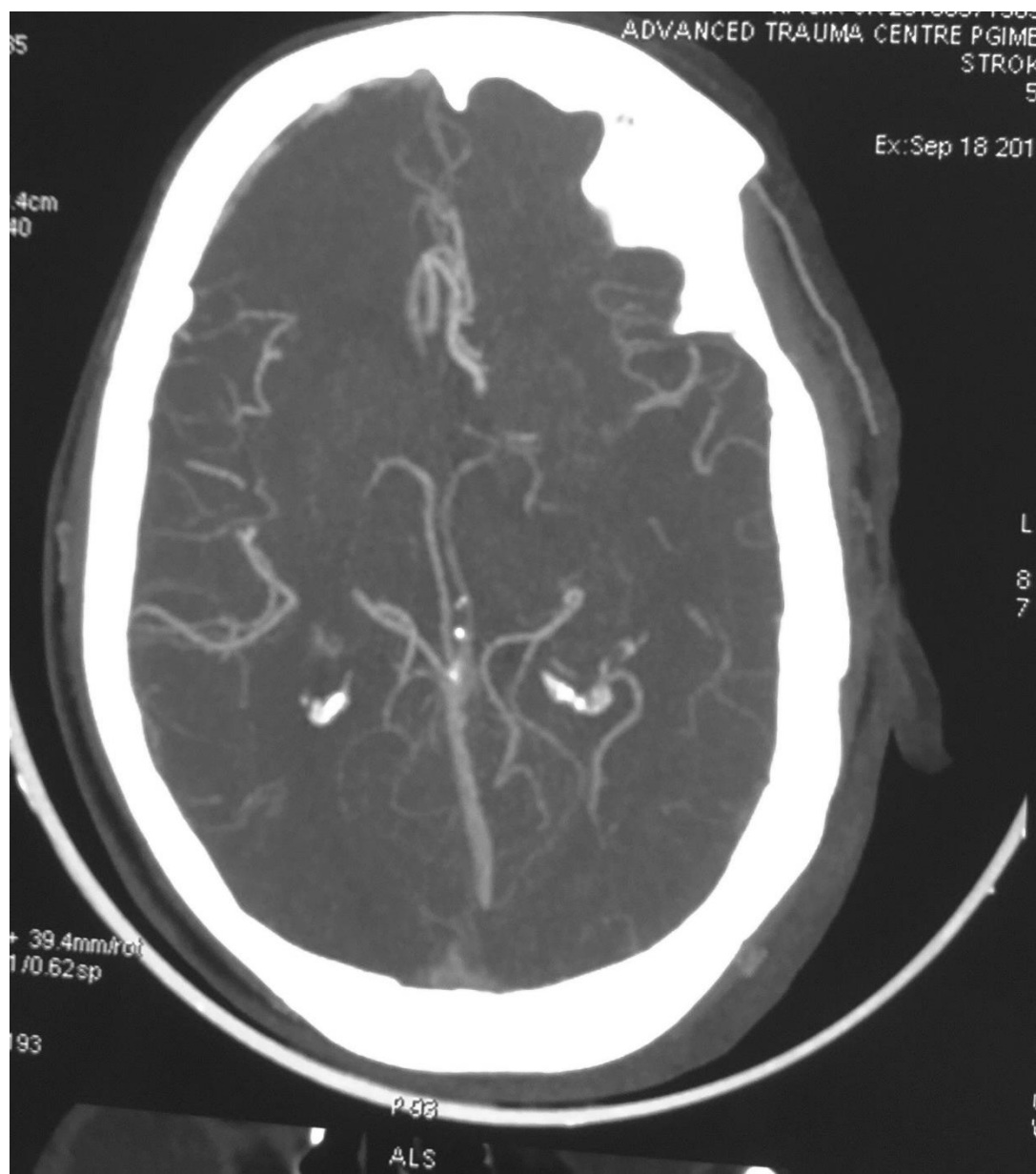
39.4mm/rot  
1/0.62sp

288

1130















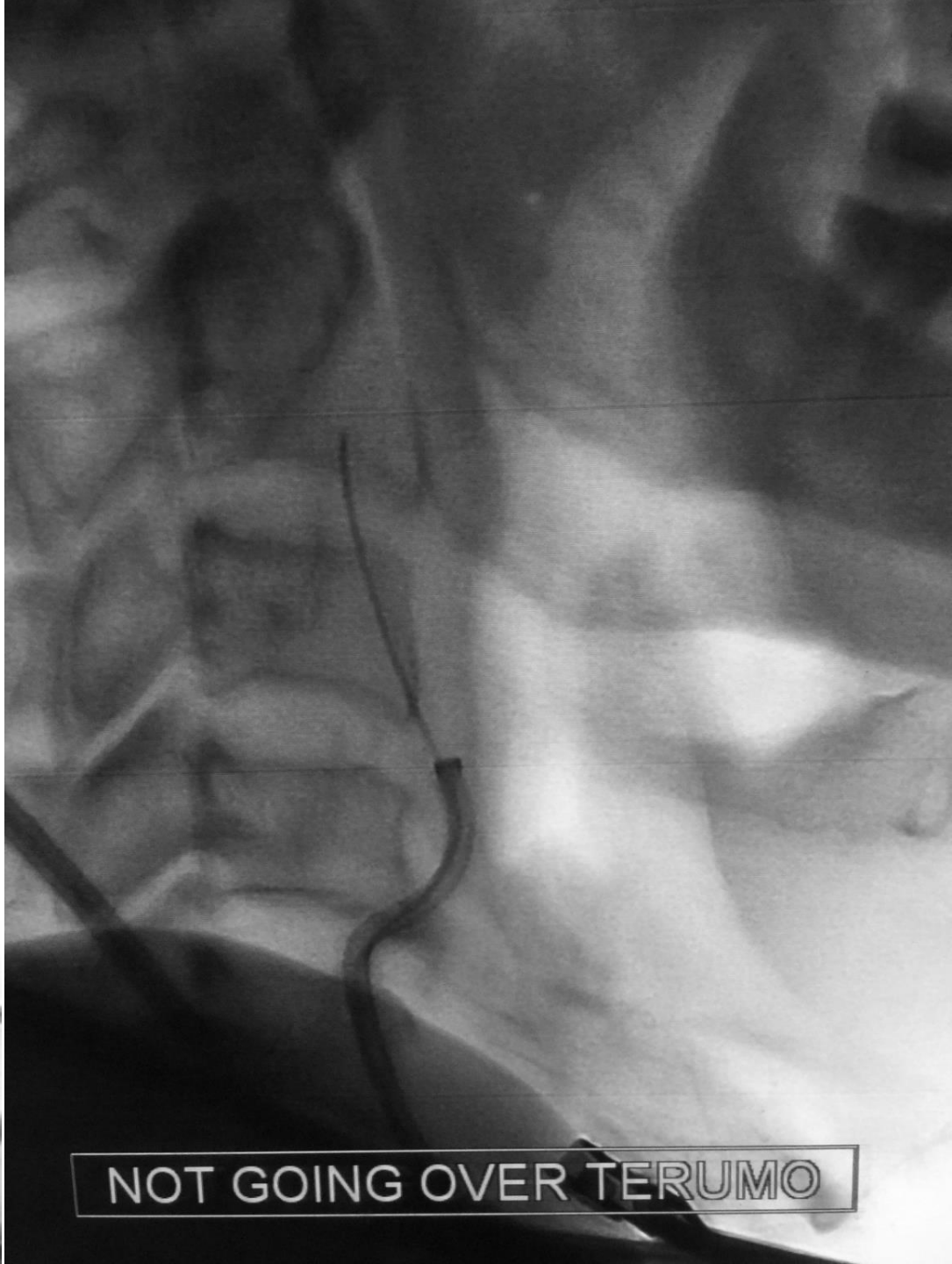
NOT GOING OVER TERUMO



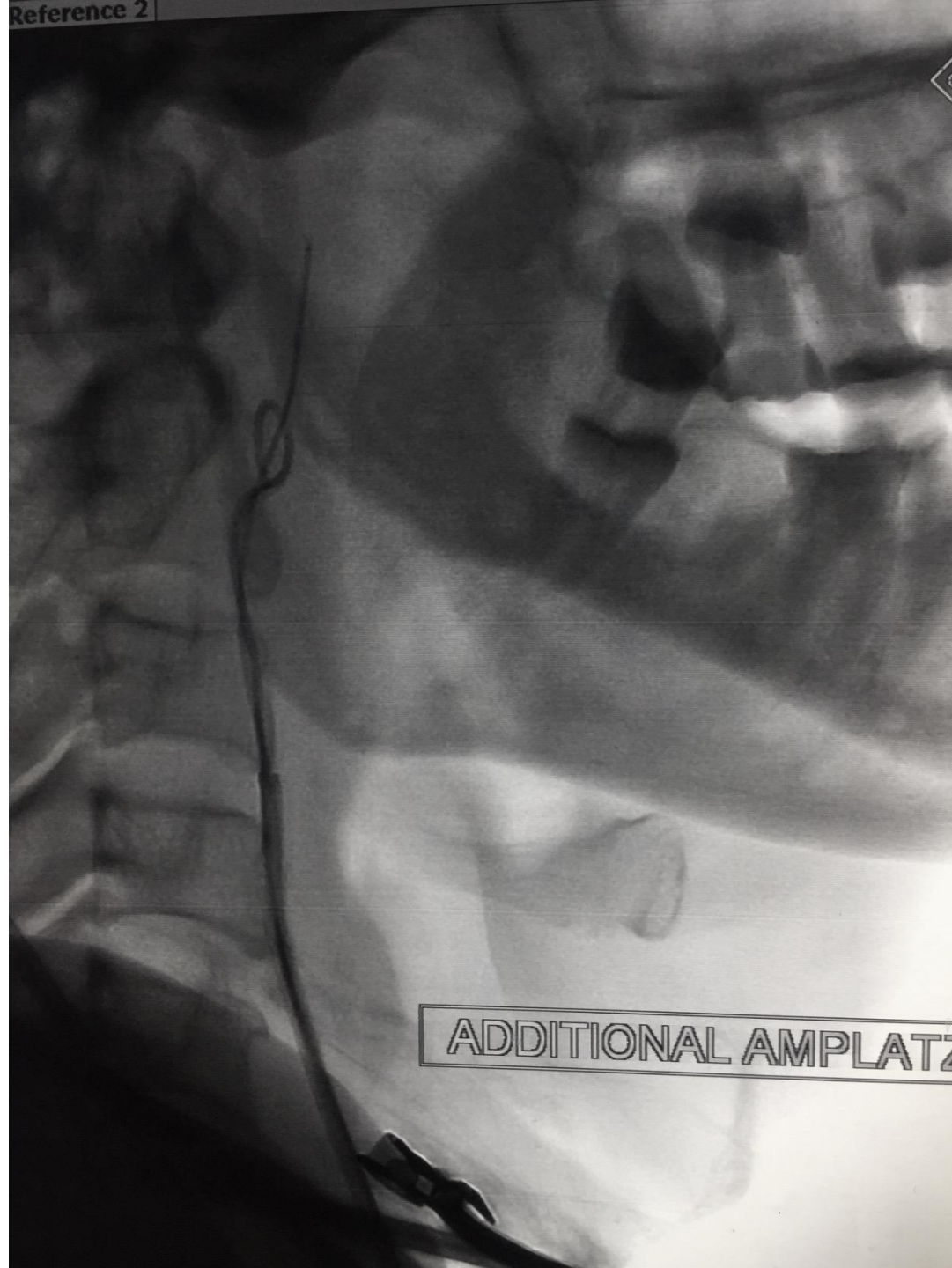


# CASE 2

- WHAT NEXT
- Angioplasty with balloon
- Angioplasty with stenting
- Change the guide to stiffer one
- Some other maneuver



NOT GOING OVER TERUMO



ADDITIONAL AMPLATZ

Reference 2



to Reference 1 | Reference 2



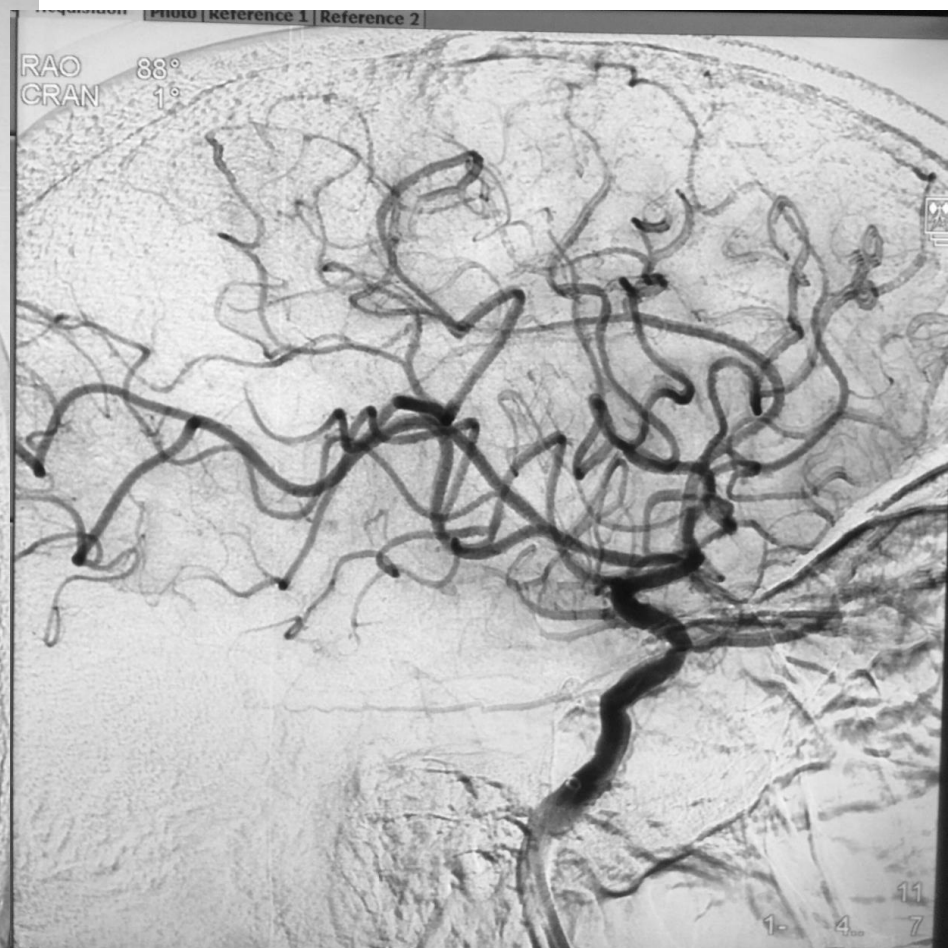










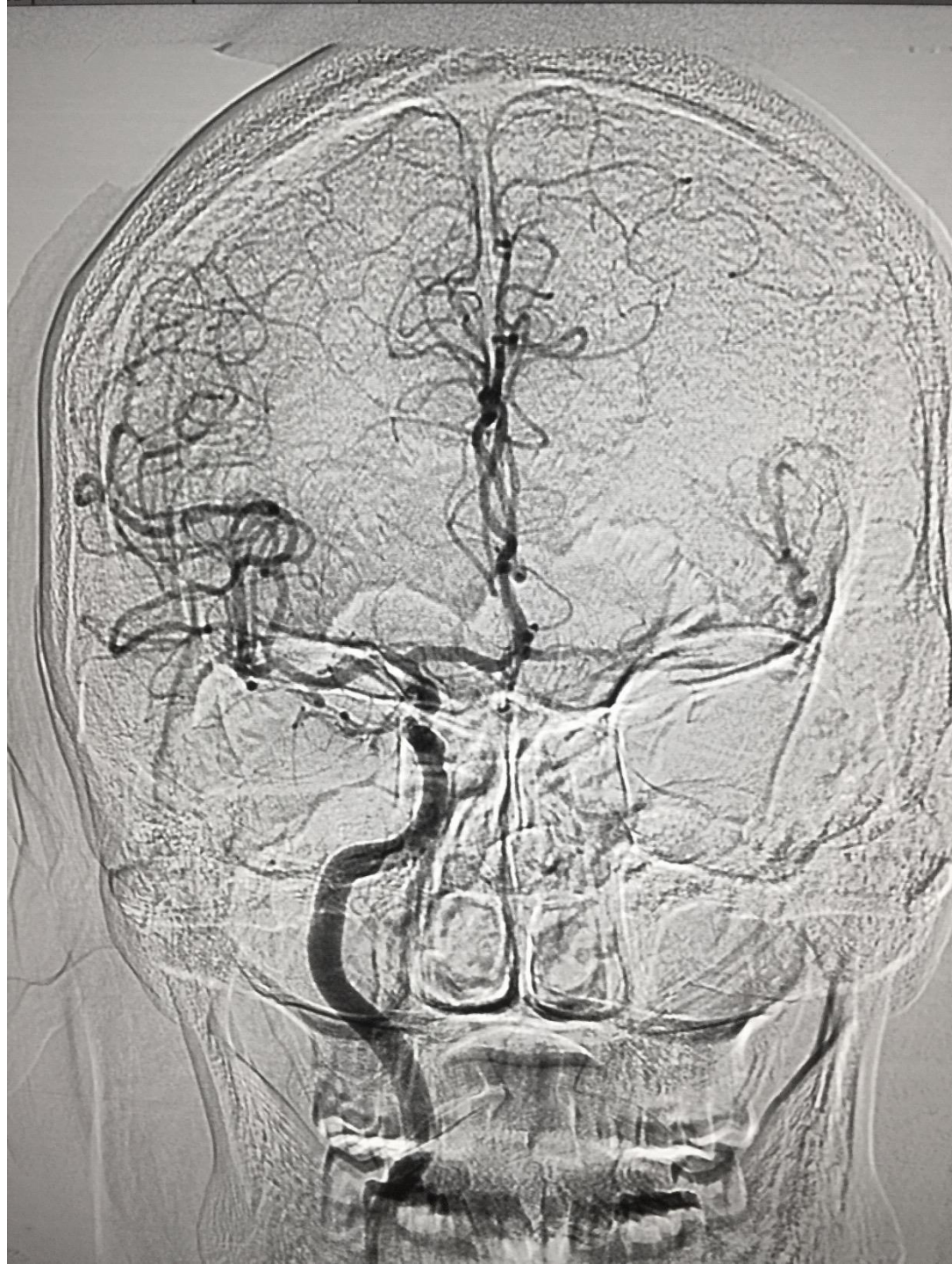






1-

4..









# Case 2

## Decision

- Good collateralization through Acom and PIAL ACA circulation
- Interval stenting for carotid lesion
- Patient on active clinical FU completely recovered
- Planned for elective carotid stenting

ICCA STROKE 2019



Thank you all