ORIGINAL ARTICLE

T a f T bec 6 24 H . af e S e D e Ba a -A e Occ .

T.G. Jovin, C. Li, L. Wu, C. Wu, Jian Chen, C. Jiang, Z. Shi, Z. Gao, C. Song, W. Chen, Y. Peng, C. Yao, M. Wei, T. Li, L. Wei, G. Xiao, H. Yang, M. Ren, J. Duan, X. Liu, Qingwu Yang, Y. Liu, Qingfeng Zhu, W. Shi, Qiyi Zhu, X. Li, Z. Guo, Qi Yang, C. Hou, W. Zhao, Q. Ma, Y. Zhang, L. Jiao, H. Zhang, D.S. Liebeskind, H. Liang, A.P. Jadhav, C. Wen, S. Brown, L. Zhu, H. Ye, M. Ribo, M. Chang, H. Song, Jun Chen, and X. Ji, for the BAOCHE Investigators*

ABSTRACT

BACKGROUND

T e effec a d f e d a c a bec 6 24 . af e e d e ba a -a e cc. ha e bee e e d ed.

METHODS

I a a c d c ed e a 5- ea . e d C a, e a d a ed, a 1:1 a , . a e ba a -a e , e . e ed be ee 6 24 . af e e ece e e e ed ca e a . . bec ed ca e a (c). T e a . a . c e, a c e f 0 4 e d f ed Ra , ca e (a e, 0 6, a c e f 0 d ca d ab - , 4 de a e e e d ab , a d 6 dea) a 90 da , a c a ed a d f c a a (a d f ed Ra , ca e c e f 0 3, a c e f 3 d- ca de a e d ab). P a afe . c e e e a c ac a- a he a e a 24 . a d 90-da a .

RESULTS

A a f 217 a e (110 e bec . a d 107 e c . .) e e c. ded e a a ; a d a cc ed a a ed a f 663 . e af e e . E e a ha ed a a . ec f ed e a a beca e f e . e f bec . T b a . ed 14% f e . a e e bec . a d 21% f e e c . . . A d f ed Ra , ca e c e f 0 3 (a . c e) cc ed 51 , a e (46%) e bec . a d 26 (24%) e c . . (ad . ed a e a , 1.81; 95% c f de ce e a [CI], 1.26 2.60; P<0.001). T e e . f e a . a . c e f a d f ed Ra , ca e c e f 0 4 e e 55% a d 43%, e . ec e (ad . ed a e a , 1.21; 95% CI, 0.95 1.54). S a c ac a he a cc ed 6 f 102 . a e (6%) e bec . a d 1 f 88 (1%) e c . . (, a , 5.18; 95% CI, 0.64 42.18). M a a 90 da a 31% e bec . a d 42% e c . . (ad . ed , a , 0.75; 95% CI, 0.54 1.04). P ce- d a c ca cc ed 11% f e . a e . de e bec .

CONCLUSIONS

A . a e e d e ba a -a e cc. . e ed 6 24 . af e e , bec ed a e . ece a e d f c a a a 90 da a ed ca e a b a a ca ed . ce- d a c ca a d e ce eb a he a e . (F ded b e C e e Na a M f Sc e ce a d Tec ; BAOCHE C ca T a . be , NCT02737189.)

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*A list of the BAOCHE investigators is provided in the Supplementary Appendix, available at NEJM.org.

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RANDOMIZED TRIALS INVOLVING PA- e a e cc. e a e c c a- a e a be ef f e d a c a bec .[1,2] T e e a e c. ded a e ba a -a e cc. , a e e a - c a ed . T e E d a c a T ea e e S a da d Med ca T ea e f Ve eb ba a A e Occ. (BEST) a[3] a d e Ba a A e I e a a C e a S d (BASICS)[4] d d a c ea be ef f bec e ed ca ca e a e ba a -a e cc. , b b a ad e d c a .[5] I a bee - a ed a a ca a d a ca c a ac e c f e b a a d ce ebe , c a e ed b b a c e f e ba a a e , a e e e a c e a a c e ed b e a e ce eb a c c a . T e e c a ac e c a a e- e f a e ba a -a e e a e a effec e a e e d af e e e a ee a e a - e c c a e.[6] We c d c ed e Ba a A e Occ. C e e E d a c a (BAOCHE) a a e e effec a d afe f e d a c a bec c c ed ca e a , a c a ed ed ca e - a a e, a e ac e c e c e d e ba a -a e cc. a d a ab e ce f a a e ba e e fa c e a de e a d , a 6 24 af e e

METHODS

TRIAL OVERSIGHT

We c d c ed a e a - a ed, - ce e , e - abe , a d , ed, c ed a b ded c e e a. a . T e a . - c , a a ab e e f e f a c e a NEJM. , a a. ed b e a e e b a d a a a c. a e . E ed a e e a e . ded e - f ed c e f a c. a e a . T e a a de ed a d c d c ed b a ee c ee c ed f de e de acade c e a , a d e a a ed b a de e de da a a d afe b a d. A de e de c ca -e e c ee ad. - d ca ed afe c e , ced e- e a ed c -

ca , a d e ad e e e e . A c e ab a a e ed a e a de a b ded a e .

T e a a f ded b a e f a. d e

c c a Ac e S e P Ea CT Sc e (PC-ASPECTS) f e a 6 (a e, 0 10, h e a. e d ca e fac b de) c ed (CT), CT a a c (CTA) ce a e, d ff e ed a e c e ace a (MRI)[8]; a d he. e e ce CT, CTA ce a e, MRI f a a e fac he b a , def ed a aP -M db a I de f e a 2. (a e, 0 8, h e a. e d ca e fac b de; 1. a b ed fac f <50% a d 2. fac f 50% e de f he. db a).[9] De a f he c. a de c. c e a a e. ded Tab e S1 he S. . e a A. . e d , a dde a ed f a he ec e- a a d he a e e a da e e a be . b ed. e . .[10]

Pa e e e a d a ed a 1:1 a de h bec . ece e a- da d ed ca ca e (h bec .) ece e a da d ed ca ca e a e (c . .). Pa e c. d ece e a e. h b a he efe h. a a he e d ac a ce e h c h e e a- fe ed f he a ed h he acce. ed- d f h b c ea e f 4.5 h. a d e de e f afe ea e. Pa e had . a f he h b c d. a d e e e b e f e b e e b he . - a ce e . Ra d , a a . e f ed b ea fa ce a, Web-ba ed. ced e, h he. e fa , a . ce ba a ce he ea e . a d h a fca- acc d a e (. 70 ea >70 ea), he e f ea e a d , a- (6 12 h. >12 24 h.), a d ba e e NIHSS c e (6 20 >20).

A he. a e e ea ed ac e , e e c e e ca e. a d ea ed acc d c e Ch e e. de e f ac e ch c , e a a e e (ee he S. . e a A. e d). Th bec a . e f ed h he S a e de ce, a e, e ab e a d de ac hab e e f-e. a d e ha . ed e e cc. e h b a d e e b d f . Re c e e e f he a h he de- ce . ha ac c a e a . e - ed e ce f ba a . a e f he e eb a a e ba a a e (ee he S. . e a A. e d).

OUTCOMES

The . a . c e a d f c a a- , def ed a a c e f 0 3 he d- f ed Ra , ca e (a e, 0 [ ] 6 [dea h]), a 90 da . O c e e e b a ed b ea fa . c ed e e [11] c d c ed b ca a e (. e b ee h e) h e e. a a e f he ea e a e . a d b ce a a e (b ea f de a d ec d) h e e ce f ed a e he d f ed Ra , ca e c e a d e e. a a e f he ea e a e . A he. a e h e e a a ab e f e a. a a 90 da had . c e da a b a ed b ca e a. a h e e. a a e f he ea e a e . I . a e h dec ed ha e a d a d de ec d , ce a e a. a e e . The . a a a . ed ce a e a. a a he defa a d ca e a. a he ce a e a. a- e e (ee he S. . e a A. - e d). S b . . a a e e e. e. ec f ed f he e. a . c e acc d a e (. 70 >70 ea), d c h . ba e e NIHSS c e (6 20 >20), ba e e NIHSS c e (6 9, 10 20, >20), a d , a d (6 12 h. >12 24 h.), ba e e PC-ASPECTS (9 10 <9), a d ca f ba a -a e cc. (a, dde, d a ba a a e).

O Feb. a 23, 2021, af e he e e f 215 . a e , 211 f h had c , e ed 90 da ff - . , a d bef e he. b d f da a he e a a c ee, c e . h he a da a a d afe - b a d, he ee c ee f he a dec ded e a c ha e he. a . c e, f a d f ed Ra , ca e c e f 0 4 a 90 da a c e f 0 3 a 90 da . The a . a . c e a c ha ed a ec da . c e. Th dec a ade beca e. e . a a ab e da a f a d , ed a [3,4] h ed ha he c ff he d f ed Ra , ca e ha a f- a e f ea e be ef . a e h ba a , e a a a c e . . f 0 3 a c a ed h 4 6, a a h a e- a . a e he ba f. e , . a e ce e ed . c e .[12] I add , he cha e he. a . c e a ed f a e h he e. fc a e. a d , ed a fe d ac a ea e f ba a -a e , e.

Sec da . c e be de e a . - a . c e c. ded f c a de. e de ce (d f ed Ra , ca e c e, . 2); e d a (f) a a f d f ed Ra , ca e c e be ee e a 90 da ; e e e a - c a , a a a e ed CTA a e c e a ce a a (MRA) a 24 . ; e Ba e I de (a e, 0 100, h e c e d ca e d ab); d a a c e - c e e, h c a def ed a ed c- f a ea 8. e NIHSS a c e f 0 2 a 24 . ; e NIHSS c e a 90 da ; a d ea h a a ea. ed e E Q L G . . 5-D e 3-Le e (EQ-5D-3L) . a e e ed . e a e (a e, 0.149 1.00, h e c e d ca be e a f fe) a 90 da , 6 h , a d 12 h . I e h bec . . , e c e ab a . ed . ced a c e a a a h ad- . d ca e . cce f e e e a c a , a , h c a def ed a ade 2b 3 (d ca e e f - f >50% f e affec ed e) e

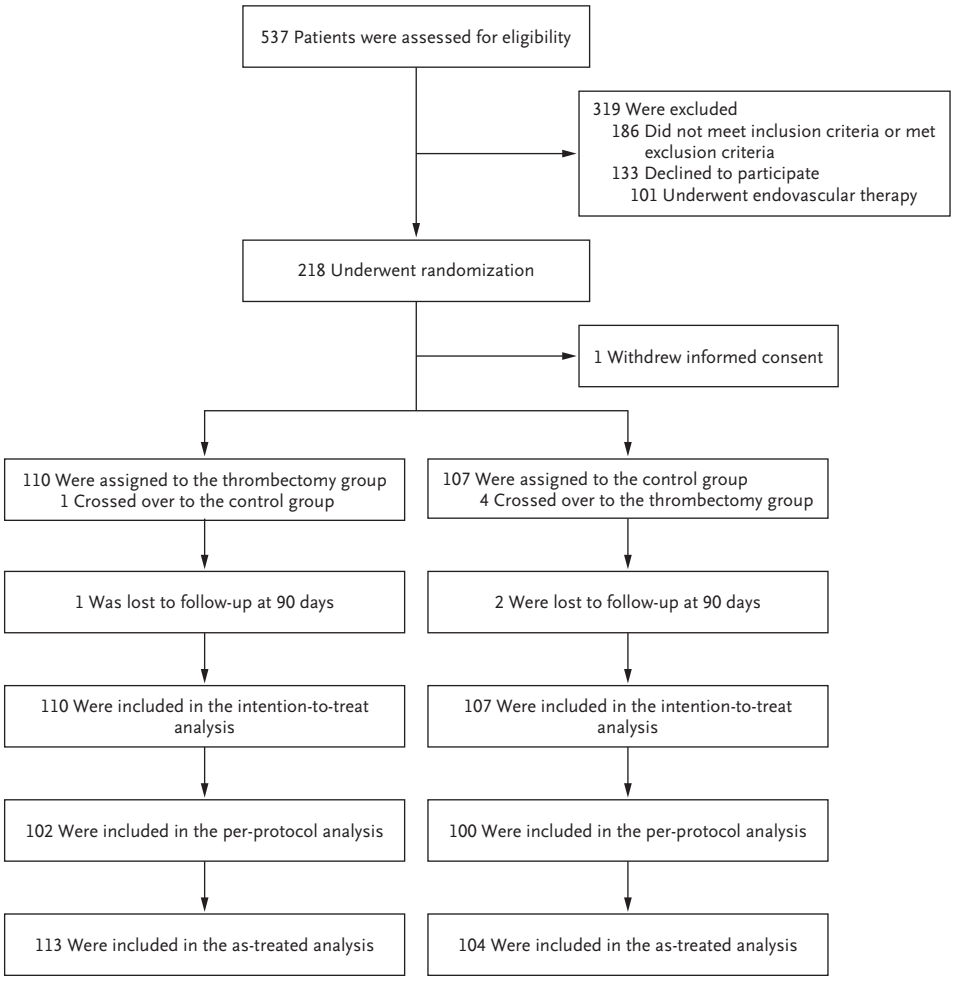

Figure 1. Screening, Randomization, and Follow-up of the Patients.

The per-protocol population included patients without major protocol deviations. The as-treated population included patients according to the treatment they received.

RESULTS

CHARACTERISTICS OF THE PATIENTS

F A . 2016 . J e 2021, a a f 218 , a e . de e a d , a (110 the bec a d 108 the c .) a d ad ea ed 90 da f f - , a the e a e a a . ed. F . , a e the c . c ed e ece e d - a c a ea e , a d 1 the bec . c ed e ece e ed ca ca e . O e , a e the c . . d e c - e a d a e c. ded f the a a (F . 1). M . a - c e da a e e . ed f 3 , a e . T e . a a a . ed ce a e a . a (31 de a d 59 a d) e a a - ab e a d ca e a . a the e a 47 ca e .

T e c a ac e c f the a e a ba e e e a the a . (Tab e 1 a d Tab e S3). T e ed a a e f the . a e a 65 ea , a d 27% f the . a e e e . Ra d , a cc ed a a ed a f 663 - e af e e. T e ed a NIHSS c e a 20, a d the ed a PC-ASPECTS a 8. I a e . a e a e a ad e ed 18% f the . a e e a (15 . a e [14%] the bec . a d 23 [21%] the c .). I 32% f the . a e , the a e d. ed f e ec a MRI

Table 1. Characteristics of the Patients at Baseline.*

Characteristic	Thrombectomy (N=110)	Control (N=107)
Age — yr	64.2±9.6	63.7±9.8
Male sex — no. (%)	80 (73)	79 (74)
Medical history		
Atrial fibrillation — no. (%)	14 (13)	13 (12)
Diabetes mellitus — no. (%)	30 (27)	29 (27)
Hypertension — no./total no. (%)	90/110 (82)	79/106 (75)
Modified Rankin scale score of 0 before stroke — no. (%)	85 (77)	89 (83)
NIHSS score†		
Median (IQR)	20 (15–29)	19 (12–30)
Distribution — no. (%)		
6–20	66 (60)	61 (57)
>20	44 (40)	46 (43)
Median systolic blood pressure at hospital arrival (IQR) — mm Hg‡	157 (138–175)	152 (138–166)
Median glucose level at hospital arrival (IQR) — mmol/liter§	8.0 (6.4–9.9)	7.6 (6.0–10.2)
Intravenous thrombolysis — no. (%)	15 (14)	23 (21)
Imaging characteristics		
Median PC-ASPECTS (IQR)¶	8 (7–10)	8 (7–10)
Median Pons-Midbrain Index (IQR)‖	1 (0–2)	1 (0–2)
Basilar-artery occlusion site — no./total no. (%)**		
Proximal basilar artery	53/107 (50)	45/105 (43)
Middle basilar artery	40/107 (37)	37/105 (35)
Distal basilar artery	13/107 (12)	23/105 (22)
Workflow times		
Distribution — no. (%)		
6–12 hr	64 (58)	71 (66)
>12 hr	46 (42)	36 (34)
Median duration (IQR) — min		
From stroke onset to randomization	664 (512–861)	662 (492–838)
From stroke onset to revascularization††	790 (626–1000)	NA
From hospital admission to groin puncture‡‡	153 (99–235)	NA
From groin puncture to revascularization§§	85 (59–129)	NA

* Plus–minus values are means ±SD. IQR denotes interquartile range, and NA not applicable.
† Scores on the National Institutes of Health Stroke Scale (NIHSS) range from 0 to 42, with higher scores indicating more severe neurologic deficits.
‡ Data were missing for one patient in the thrombectomy group.
§ Data were missing for 11 patients in the thrombectomy group and for 13 in the control group. To convert the values for glucose to milligrams per deciliter, divide by 0.05551.
¶ The posterior circulation Acute Stroke Prognosis Early CT Score (PC-ASPECTS) is a measure of the extent of posterior circulation early cerebral ischemia. Scores ranges from 0 to 10, with higher scores indicating fewer early ischemic changes. Shown are values as assessed by the core laboratory. Scores were not available for four patients in the thrombectomy group.
‖ The Pons-Midbrain Index, a measure of the extent of early cerebral ischemia in the pons and midbrain, ranges from 0 (absence of early cerebral ischemia in the midbrain and pons) to 8 (>50% early cerebral ischemia on both sides in these brain-stem territories); 1 point is attributed to infarction of less than 50%, and 2 points to infarction of 50% or more on one side of the pons or midbrain. Scores were not available for four patients in the thrombectomy group.

(Table S4). A [illegible] f 22 [illegible] a[illegible]e [illegible] a ed a[illegible] [illegible]e [illegible] bec[illegible] ce [illegible]e [illegible] 4.5 [illegible]. af[illegible]e [illegible] e e[illegible] 12 (55%) f [illegible] ece ed [illegible] a e- [illegible] b , a d 39 [illegible] a[illegible]e [illegible] a ed a[illegible] [illegible]e efe [illegible] [illegible] a e [illegible]a 4.5 [illegible]. f [illegible] [illegible]e [illegible]e f [illegible] e e[illegible] f [illegible] 26 (67%) e- ce ed [illegible] a e [illegible] b .

T[illegible] bec[illegible] a [illegible] e f [illegible]ed 106 f [illegible]e 110 [illegible] a[illegible]e [illegible] [illegible] [illegible]ad bee a ed [illegible] [illegible]e [illegible] bec[illegible] [illegible] [illegible], a d c e ab a[illegible] [illegible]ad- d ca[illegible]ed e e f cc ed 88% f [illegible]e [illegible] a- [illegible]e [illegible]. Ge e a a e [illegible]e a a [illegible] ed 72 [illegible] a[illegible]e [illegible] (65%) [illegible] [illegible]ad bee a ed [illegible] [illegible]e [illegible] bec-

Table 2. Trial Outcomes.*

Table 2. (Continued.)

** Scores on the Barthel Index range from 0 to 100, with higher values indicating good performance of daily living activities. A score between 95 and 100 indicates no disability that interferes with daily activities. Included in this analysis were patients who were alive at 90 days.

†† Patency was defined as a score of 2 or 3 on the Arterial Occlusive Lesion scale, which ranges from 0 (complete occlusion) to 3 (complete recanalization and restoration of the target artery). Data for follow-up angiography were not available for 57 patients because of clinical instability or death.

‡‡ The EuroQoL Group 5-Dimension 3-Level (EQ-5D-3L) patient-reported questionnaire is a standardized instrument for the measurement of health status. Scores range from –0.149 to 1.00, with higher scores indicating better quality of life. Data were available for 68 patients in the thrombectomy group and for 52 in the control group.

§§ Reperfusion on digital subtraction angiography was defined as a modified TICI grade of 2b or 3. A modified TICI reperfusion grade of 2b or higher indicates antegrade reperfusion of more than half the ischemic territory of the previously occluded target artery.[13] Nine angiographic images were missing or could not be assessed for modified TICI because of poor image quality.

¶¶ Symptomatic intracranial hemorrhage was defined as parenchymal hemorrhage type 2 on follow-up imaging and neurologic worsening of at least 4 points on the NIHSS, according to the Safe Implementation of Thrombolysis in Stroke–Monitoring Study (SITS-MOST) criteria, or any symptomatic intracranial hemorrhage and neurologic worsening of at least 4 points on the NIHSS, according to the second European–Australasian Acute Stroke Study (ECASS II) criteria. Follow-up scans were unavailable because of clinical instability or death in 8 patients in the thrombectomy group and in 19 in the control group. The risk ratios are presented as unadjusted values because of nonconvergence in the adjusted analysis.

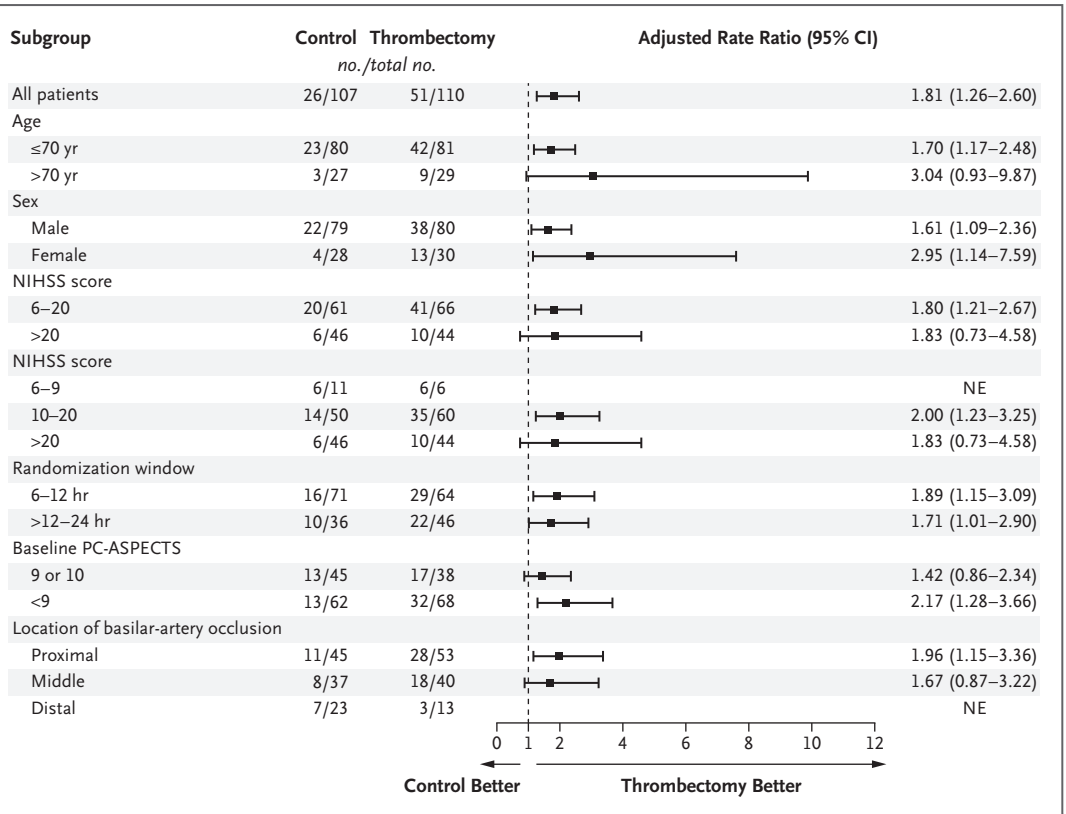

Figure 3. Subgroup Analyses of a Modified Rankin Scale Score of 0 to 3 at 90 Days (Primary Outcome).

Scores on National Institutes of Health Stroke Scale (NIHSS) range from 0 to 42, with higher scores indicating greater neurologic deficits. The posterior circulation Acute Stroke Prognosis Early CT Score (PC-ASPECTS) is a 10-point grading system that measures the extent of posterior circulation early cerebral ischemia; scores ranges from 0 to 10, with higher scores indicating fewer early ischemic changes. The adjusted rate ratio in subgroups of patients with a baseline NIHSS score of 6 to 9 and with distal basilar-artery occlusion could not be estimated (NE) because of limited sample sizes. The trial was not powered for and had no prespecified correction for multiple comparisons for a definitive analysis of subgroups.

SAFETY OUTCOMES

The c de ce f c ac a a e ha e a 24 ba ed e. a def (acc d the SITS-MOST c e a) a he he bec . . a he c . . (6% . 1%; ad ed a , 5.18; 95% CI, 0.64 42.18); the c de ce ba ed he ec da def (acc d the ECASS II c e a) a 9% the bec . . a d 2% the c . . (ad ed a , 3.88; 95% CI, 0.86 17.49). M a a 90 da a 31% the bec . . a d 42% the c . . (ad ed a , 0.75; 95% CI, 0.54 1.04) (F . S9). I the bec . . , . ced e e a ed c ca , c d d ec , e f a , a d d a e b a , cc ed 12 f 110 a e (11%). The c de ce f ed ca c ca a a the (Tab e 2 a d Tab e S8 a d S9).

DISCUSSION

O a hed that a e be a e the ed e ba a-a e cc . a d e 6 24 ea e, the c de ce f a d f c a a , def ed a a d f ed Ra ca e c e f 0 3, a he bec a da d ed ca ca e ha a da d ed ca ca e a e. The 95% c f de ce e a f the be ee . d ffe e ce the a a f the a a c e f a d f ed Ra ca e c e f 0 4 c ded e , a f d that e e . T bec a a c a ed . ced a c ca a d ce eb a e ha e that a ha e bee the e f e e f , c d a he c de ce f a c ace eb a ha e tha a be ed the c . . H e e , a a 90 da a a the . . .

The e e d ffe f e f e the a f e d a c a ea e f ba a-a e e (BASICS a d BEST) a d a e a the E d a c a T ea e f Ac e Ba a-A e Occ (ATTENTION) a , the e f h c a e e ed e f the *Journal*.[18] BASICS e c ed e e a e he e e ed 6 af e e a ed e e a d the a c ded a a e . . f a e had ece ed ea e a e a e a e, a effec e ea e f e d e ba a-a e cc . [19,20] The e a e . f BASICS d d . e . a be ef c a effec f bec , a d the e a a . e f be ef fa f bec . a e a ba e e NIHSS c e f a ea 10. De . e the c . f . a e he . e e ed a NIHSS c e f a ea 6 . a , f . a e had a ba e e NIHSS c e f a ea 10. The ef e, . ce a e e a d the be ef f bec a c . a ed ed ca ca e . a e e e a NIHSS c e f e a 10.

O the ba f . e . e d ca that the e e f fa c the . e c c a , a d . a c a the b a e, a . ed c f . c e af e bec f ba a-a e cc ,[8,21] e e c ed e e a e d d a e a e ba e e fa c the e a a ca e , h c a the e e a ab f the e . f . a . F e d e a add e . e e a d the . e f a f the e ec f . a e ba a-a e cc . de bec .

O a ha a . F . c c ha e e e ade d the a , a b the . a . c e, the ba f da a f the a that e e . a a ab e a the e f the . c de . The e ed . c e, a d f ed Ra ca e c e f 0 3 a e e e d f c a a , ha bee c de ed be ea f . a e [12] a d ha bee . ed a the . a . c e the a d , ed a . a e ba a a e e. T c ha e a e ed b the ee c ee he e be e e . a a e f the a e . . Sec d, ce the . . . a that a e ed e e e a e f the Ha C e e . . . a , the e e a ab f a e . . the . . . a ed. I add , . a e . de e bec . de the a , a d c ec e e e d d cc . F the e, the ca e f the . de cc . a e a . ed a a the b c, a d the ab de e a be ef f bec . a e e b c , a e . e that a be e . e a e W e . . . a that the Ha C e 9.1 9.999.99()147 (3 ( ) ( ) -15 (e) -3 (e)-.01 ()

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APPENDIX

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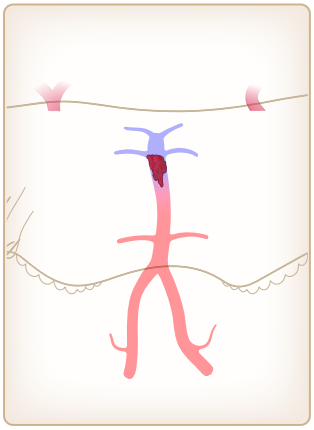

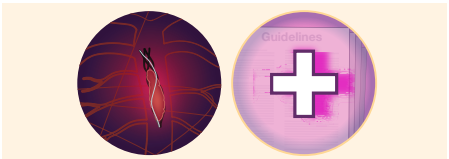
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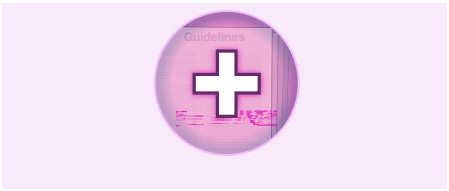
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