



Cover caption: Algorithm of various techniques for ophthalmic artery catheterization from the article by Kocharian G et al.

#### Editor-in-Chief

Felipe C. Albuquerque

#### Deputy Editors

David Fiorella

Joshua Hirsch

#### Commissioning Editor

Michael Chen

#### Associate Editors

Jildaz Caroff

Reade De Leacy

Kyle Fargen

Jens Fiebler

Violiza Inoa

Akash Kansagra

Thabele Leslie-Mazwi

Michael Levitt

Mario Martinez-Galdamez

Justin Mascitelli

James Milburn

Isil Saatci

Edgar Samaniego

Jai Shankar

#### Associate Editors, Basic Science

Matthew Gounis

David Steinman

#### Assistant Editors, Social Media

Dorothea Altschul

Matthew Amans

Andrew Ducruet

Matthew Fusco

#### Assistant Editors, Technical Videos

Peter Kan

Maxim Mokin

#### Editor Emeritus

Robert Tarr

#### SNIS Executive Director

Marie Williams-Slow

#### Editorial Office

Journal of NeuroInterventional Surgery BMJ

Publishing Group Ltd

BMA House

Tavistock Square

London, WC1H 9JR, UK

E: [info.jnis@bmj.com](mailto:info.jnis@bmj.com)

#### Guidelines for authors and reviewers

Full instructions are available online at <http://jnis.bmj.com/fora>. Articles must be submitted electronically <http://mc.manuscriptcentral.com/jnis>. Authors retain copyright but are required to grant JNIS an exclusive licence to publish <http://jnis.bmj.com/fora/licence.dtl>

ISSN: 1759-8478 (print)

ISSN: 1759-8486 (online)

X: @JNIS\_BMJ

**Disclaimer:** The Editor of *Journal of NeuroInterventional Surgery* has been granted editorial freedom and *Journal of NeuroInterventional Surgery* is published in accordance with editorial guidelines issued by the World Association of Medical Editors and the Committee on Publication Ethics. *Journal of NeuroInterventional Surgery* is primarily intended for healthcare professionals and its content is for information only. The Journal is published without any guarantee as to its accuracy or completeness and any representations or warranties are expressly excluded to the fullest extent permitted by law. Readers are advised to independently verify any information on which they choose to rely. Acceptance of advertising by *Journal of NeuroInterventional Surgery* does not imply endorsement. Neither SNIS nor BMJ Publishing Group Limited shall have any liability for any loss, injury or damage howsoever arising from *Journal of NeuroInterventional Surgery* (except for liability which cannot be legally excluded).

**Copyright:** © 2024 Society of NeuroInterventional Surgery. All rights reserved; no part of this publication may be reproduced in any form without permission. *Journal of NeuroInterventional Surgery*, ISSN 1759-8478, BMA House, Tavistock Square, London WC1H 9JR, UK. The US annual subscription price is \$272. Airfreight and mailing in the USA by agent named World Container Inc, 150-15, 183rd Street, Jamaica, NY 11413, USA. Periodicals postage paid at Brooklyn, NY 11256. US Postmaster: Send address changes to *Journal of NeuroInterventional Surgery*, World Container Inc, 150-15, 183rd Street, Jamaica, NY 11413, USA. Subscription records are maintained at: BMJ, 12th Floor, Southgate House, Wood Street, Cardiff CF10 1GH, UK. Air Business Ltd is acting as our mailing agent.

## Contents

Volume 16 Issue 4 | JNIS April 2024

### Commentary

- 329** Middle meningeal artery embolization for chronic subdural hematoma: an effective treatment with a bright future  
*M R Levitt, J A Hirsch, M Chen*

### Editor's column

- 331** Preventing air microembolism in cerebral angiography: a JNIS fellow's perspective  
*A S Cruz, N K Khattar, G M Weiner, Z S Aljuboori, C M Schirmer*

### The pandemic and neurointervention

- 333** Acute ischemic stroke outcomes in patients with COVID-19: a systematic review and meta-analysis  
*S R Ferrone, M X Sanmartin, J Ohara, J C Jimenez, C Feizullayeva, Z Lodato, S Shahsavarani, G Lacher, S Demissie, J M Vialet, T G White, J J Wang, J M Katz, P C Sanelli*

- 342** Outcomes in patients with large vessel occlusion strokes undergoing mechanical thrombectomy with concurrent COVID-19: a nationwide retrospective analysis  
*I A Ramsay, H Fountain, T Elarjani, V Govindarajan, M Silva, A Abdelsalam, J D Burks, R M Starke, E Luther*

### Ischemic stroke

- 347** Rescue stenting after failure of endovascular thrombectomy for acute vertebrobasilar artery occlusion: data from the PERSIST registry  
*Y Lu, Z Wu, Z Wang, P Zhang, F Zhang, M Hu, W Lan, Y Liang, J Yi, W Sun*

- 352** The immunologic phenotype of thrombi is associated with future vascular events after cerebral infarction  
*W Yang, S A Hong, J-M Kim, H-B Jeong, T-K Nam, H H Choi, S M Kim, K-Y Park, H R Kim*

- 359** Systemic THrombolysis Randomization IN Endovascular Stroke Therapy (SHRINE) Collaboration: a patient-level pooled analysis of the SKIP and DEVT Trials  
*R G Nogueira, K Kimura, Y Matsumaru, K Suzuki, Z Qiu, W Zi, T P Moran, F Li, H Sang, W Luo, S Liu, J Yuan, J Song, J Huang, M Takeuchi, M Morimoto, T Otsuka, Q Yang*

### Hemorrhagic stroke

- 365** Cerebral aneurysms: Germany-wide real-world outcome data of endovascular or neurosurgical treatment from 2007 to 2019  
*C Haverkamp, K Kaier, M Shah, C von zur Mühlen, J Beck, H Urbach, S Meckel*

- 372** Flow diversion for basilar quadrifurcation aneurysms  
*V M Srinivasan, J H Jubran, H O Stonnington, J S Catapano, L Scherschinski, B K Hendricks, E A Winkler, R F Rudy, B A Nguyen, S J Dabrowski, A P Jadhav, A F Ducruet, F C Albuquerque*

- 379** Pipeline embolization device versus Atlas stent assisted coiling for intracranial aneurysm treatment: a retrospective, propensity score matched study with a focus on midterm outcomes and hospital costs  
*C Wang, L Dong, J Liu, Y Zhang, K Wang, P Liu, X Yang, M Lv, Y Zhang*

- 385** Diffusion-weighted imaging lesions after intracranial aneurysm treatment with Pipeline Flex and Pipeline Flex with Shield technology: a retrospective cohort analysis  
*G M Cortez, V H C Benalia, E Sauvageau, A Aghaebrahim, J M Pederson, R A Hanel*

- 392** Evaluation of predictive models of aneurysm focal growth and bleb development using machine learning techniques  
*S Hadad, F Mut, M Slawski, A M Robertson, J R Cebal*

### New devices and techniques

- 398** Advancements in super-selective catheterization and drug selection for intra-arterial chemotherapy for retinoblastoma: a 15-year evolution  
*G Kocharian, Y P Gobin, N Kharas, J Knopman, J H Francis, D H Abramson*

MORE CONTENTS ►



This article has been chosen by the Editor to be of special interest or importance and is freely available online.



This article has been made freely available online under the BMJ Journals open access scheme. See <http://authors.bmj.com/open-access/>



Member since 2009  
JN04666

This journal is a member of and subscribes to the principles of the Committee on Publication Ethics  
<http://publicationethics.org/>



When you have finished with this please recycle it

- 405** Evaluation of effectiveness and safety of the CorPath GRX robotic system in endovascular embolization procedures of cerebral aneurysms  
*V Mendes Pereira, H Rice, L De Villiers, N Sourour, F Clarencon, J Spears, A Tomasello, D Hernandez, NM Cancelliere, X YE Liu, P Nicholson, V Costalat, G Gascou, P Mordasini, J Gralla, M Martínez-Galdámez, J Galvan Fernandez, M Killer-Oberpfalzer, D S Liebeskind, RD Turner, R Blanc, M Piotin*

- 412** Robotically assisted deployment of flow diverter stents for the treatment of cerebral and cervical aneurysms  
*C Chivot, R Bouzerar, J Peltier, M Lefranc, T Yzet*

### Vascular neurology

- 418** Symptomatic non-stenotic carotid disease: current challenges and opportunities for diagnosis and treatment  
*J M Ospel, M Kappelhof, A Ganesh, D F Kallmes, W Brinjikji, M Goyal*

- 425** Now that the door is open: an update on ischemic stroke pharmacotherapeutics for the neurointerventionalist  
*J F Fraser, S Pahwa, M Maniskas, C Michas, M Martinez, K R Pennypacker, D Dornbos III*

### Technical video

- 429** Stereotactic-guided direct orbital puncture for treatment of orbital arteriovenous fistula  
*A Robledo, T S Frank, P J Karas, H Shaltoni, S O'Leary, R Darling, P Kan*

### Letters

- 430** Correspondence on 'Cerebral aneurysms: Germany-wide real-world outcome data of endovascular or neurosurgical treatment from 2007 to 2019' by Haverkamp et al  
*T S Cole*
- 430** Response to: Correspondence on "Cerebral aneurysms: Germany-wide real-world outcome data of endovascular or neurosurgical treatment from 2007 to 2019" by Cole  
*K Kaier, C Haverkamp, S Meckel*
- 431** Correspondence on 'Acute ischemic stroke outcomes in patients with COVID-19: a systematic review and meta-analysis' by Ferrone et al  
*T Muzaffar, A Danial, M K Ahmed*