Ukrainian Neurosurgery: Experience with Three 2023 and 2024 RAZOM Co-Pilot Endovascular Neurosurgical Missions to Ukraine

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Despite over two years of war-related turmoil, Endovascular Neurosurgeons and Radiologists continue to provide high-level care at several Ukrainian centers: addressing familiar conditions, such as subarachnoid hemorrhage and stroke in addition to a wide array of war-related neurovascular trauma. Involuntarily it has become the most active site for blast related injury in the world today.

Ukraine's rich endovascular tradition dates back to the Soviet era and the development of therapeutic catheter techniques-–particularly, the use of detachable balloons in the treatment of carotid-cavernous sinus fistulae and cerebral aneurysms; approaches pioneered and refined by Dr. Fedor Andreevitch Serbinenko (at the Burdenko Institute), and his colleague, Dr. Victor I. Scheglov (later at the Neurosurgical Institute in Kyiv).

The continued functioning of multiple centers, despite limitations in modern imaging equipment and expensive endovascular consumables, is nothing short of miraculous---enabled by the commitment and personal courage of Ukrainian physicians and support staff, as well as materials and personal assistance contributed by numerous dedicated volunteers. Physicians, nurses, and adjunctive staff, supported by several nonprofit organizations, have donated time, equipment, and expertise in all areas of medical care.

Of this family of aid programs, one of the largest: CO-PILOT, organized by Dr. Luke Tomycz, has been supported by the RAZOM for Ukraine Foundation (RUF) since 2014. Transformative nationwide changes have been made, specifically in the management of pediatric epilepsy and pediatric/adult skull base surgeries---the latter under the direction of Dr. Jonathan Forbes. Generous material donations in ongoing support of urgent medical care near the warfront in Dnipro by a network of physicians and staff, organized by Dr. Rocco Armonda, have been instrumental in saving countless lives.

The neuroendovascular arm of CO-PILOT began in April 2023 with a mission to Lviv and expanded in September 2023 and April 2024 to centers in Dnipro and Kyiv. Between 9/1 and 9/15/2023, and 3/31/2024 and 4/13/2024, Drs. Peter Kim Nelson and Maksim Shapiro, of NYU Langone Health and NYC Bellevue HHC, together with key Ukrainian partners (Drs. Yuriy Cherednichenko in Dnipro, Andriy Netliukh, Victor Salo, and Oleksandr Holub in Lviv, Dmytro V. Scheglov and Mykhailo Kostiuk in Kyiv) planned and completed over 60 complex urgent and elective endovascular operations, managing a mix of civilian and war-related conditions.

The success of the CO-PILOT mission: real support of complex cases, of necessity performed under challenging conditions (single plane imaging, typically without 3D capability, limited consumable resources), is reflected by representative cases shown in Figures 1 and 2. The ingenuity and generous attitude of many individuals staffing the various clinical settings

additionally allowed a number of in-person and online didactic and proctored sessions, including an international broadcast of several BANANAZ endovascular conferences from Kyiv. Importantly, many of the cases were streamed live to Ukrainian neurosurgical audiences unable to join in person (some of which are available at www.youtube.com/neuroangio, enabling the expertise of Dr. Cherednichenko in matters concerning the management of war-related trauma to be preserved for the world neurovascular community).

During their time in Ukraine, Drs. Shapiro and Nelson were fortunate to join with Drs. Russell Andrews and Damien Kuffler at the Ukrainian Association of Neurosurgeons Conference in Lviv September 7-9, 2023. The current Ukrainian educational model for neurosurgery is undergoing significant change. War-related disruptions of formal residency and fellowship training programs present real challenges to the development and standardization of uniform qualifications for neurosurgery within Ukraine in general, and specifically for endovascular neurosurgery. The assistance and support provided by a coalition of willing volunteers---with expertise in case-level, disease state, and operational systems of care is invaluable at this stage. The road ahead certainly is difficult, affected by economic and social conditions within the country as well as the structure of health care delivery and medical financing.

On behalf of all volunteers and staff, we have the honor to thank all who did, do, and will contribute time, expertise, financing, and material support to the centers of neurosurgical care in Ukraine. We are confident that the rich tradition of neurosurgery and neurovascular excellence in Ukraine will survive and thrive, to the pride and admiration of the free world.

References:

1 https://pubmed.ncbi.nlm.nih.gov/33385604/

2 https://pubmed.ncbi.nlm.nih.gov/36804088/

3 https://neuroangio.org/sample-page/case-archives/razom-co-pilot-neuro-ukraine-mission-case-records/

Figure 1: Collage of selected April 2024 mission cases

Figure 2: Collage of selected September 2023 mission cases

Figure 3: RAZOM CO-PILOT Neuro family