Africa

Sub-Saharan Africa is, geographically, the area and regions of the continent of Africa that lies south of the Sahara. These include West Africa, East Africa, Central Africa, and Southern Africa.

Even with its robust population growth, Africa is not producing enough neurosurgeons to meet the demands of the population due to several barriers. Delineating these challenges and barriers represents an important step in developing sustainable mechanisms for recruitment, training, mentorship, and support of burgeoning African neurosurgeons [1].

The common ancestor of modern humans and the great apes is estimated to have lived between 5 and 8 Myrs ago, but the earliest evidence in the human, or hominid, fossil record is Ardipithecus ramidus, from a 4.5 Myr Ethiopian site. This genus was succeeded by Australopithecus, within which four species are presently recognised. All combine a relatively primitive postcranial skeleton, a dentition with expanded chewing teeth and a small brain. The most primitive species in our own genus, Homo habilis and Homo rudolfensis, are little advanced over the australopithecines and with hindsight their inclusion in Homo may not be appropriate. The first species to share a substantial number of features with later Homo is Homo ergaster, or 'early African Homo erectus', which appears in the fossil record around 2.0 Myr. Outside Africa, fossil hominids appear as Homo erectus-like hominids, in mainland Asia and in Indonesia close to 2 Myr ago; the earliest good evidence of 'archaic Homo' in Europe is dated at between 600-700 Kyr before the present. Anatomically modern human, or Homo sapiens, fossils are seen first in the fossil record in Africa around 150 Kyr ago. Taken together with molecular evidence on the extent of DNA variation, this suggests that the transition from 'archaic' to 'modern' Homo may have taken place in Africa [2].

A shortage of neurosurgeons and a lack of knowledge of neuroendoscopic management of hydrocephalus limits modern care in sub-Saharan Africa. Hence, a mobile teaching project for endoscopic third ventriculostomy (ETV) procedures and a subsequent program to develop neurosurgery as a permanent specialty in Kenya and Zanzibar were created and sponsored by the Neurosurgery Education and Development (NED) Foundation and the Foundation for International Education in Neurological Surgery. The objective of this work was to evaluate the results of surgical training and medical care in both projects from 2006 to 2013.

Two portable neuroendoscopy systems were purchased and a total of 38 ETV workshops were organized in 21 hospitals in 7 different countries. Additionally, 49 medical expeditions were dispatched to the Coast General Hospital in Mombasa, Kenya, and to the Mnazi Moja Hospital in Zanzibar.

From the first project, a total of 376 infants with hydrocephalus received surgery. Six-month follow-up was achieved in 22%. In those who received follow-up, ETV efficacy was 51%. The best success rates were achieved with patients 1 year of age or older with aqueductal stenosis (73%). The main causes of hydrocephalus were infection (56%) and spina bifida (23%). The mobile education program interacted with 72 local surgeons and 122 nurses who were trained in ETV procedures. The second

project involved 49 volunteer neurosurgeons who performed a total of 360 nonhydrocephalus neurosurgical operations since 2009. Furthermore, an agreement with the local government was signed to create the Mnazi Mmoja NED Institute in Zanzibar.

Mobile endoscopic treatment of hydrocephalus in East Africa results in reasonable success rates and has also led to major developments in medicine, particularly in the development of neurosurgery specialty care sites [3].

Most data about these ventriculoperitoneal shunt infections come from the Western literature. Few data about infecting organisms in Africa are available

Ochieng' et al. conducted a retrospective study of patients with VPS infections recorded in the neurosurgical database of BethanyKids at Kijabe Hospital between September 2010 and July 2012.

Among 53 VPS infections confirmed by culture, 68% occurred in patients who were younger than 6 months. Seventy-nine percent of the infections occurred within 2 months after shunt insertion. Only 51% of infections were caused by Staphylococcus species (Staphylococcus aureus 25%, other Staphylococcus species 26%), whereas 40% were caused by gram negative bacteria. All S. aureus infections and 79% of other Staphylococcus infections were sensitive to cefazolin, but only 1 of 21 gram-negative bacteria was sensitive to it. The majority of gram-negative bacterial infections were multidrug resistant, but 17 of the 20 gram-negative bacteria were sensitive to meropenem. Gram-negative bacterial infections were associated with worse outcomes.

The high proportion of gram-negative infections differs from data in the Western literature, in which Staphylococcus epidermidis is by far the most common organism. Once a patient is diagnosed with a VPS infection in Kenya, immediate treatment is recommended to cover both gram-positive and gram-negative bacterial infections. Data from other Sub-Saharan countries are needed to determine if those countries have the same increased frequency of gram-negative infections [4].

MRI Access in Africa

MRI remains largely inaccessible to clinicians, patients, and researchers in low resource areas, such as Africa. The rapidly growing burden of non-communicable diseases in Africa underscores the importance of improving access to MRI equipment as well as training and research opportunities on the continent. The Consortium for Advancement of MRI Education & Research in Africa (CAMERA) is a network of African experts, global partners, and ISMRM/ESMRMB members implementing novel strategies to advance MRI access and research in Africa. At its inception in 2019, CAMERA set out to identify challenges to MRI usage and provide a framework for addressing MRI needs in the region. To this end, CAMERA conducted a Needs Assessment Survey (NAS) and a series of symposia at international MRI society meetings over a 2-year period. The 68-question NAS was distributed to MRI users in Africa and completed by 157 clinicians and scientists from across Sub-Saharan Africa (SSA). On average, the number of MRI scanners per million people remained at <1, of which, 39% were obsolete low-field systems but still in use to meet daily clinical needs. The feasibility of coupling stable energy supplies from various sources has contributed to the growing number of higher-field (1.5T) MRI scanners in the region. However, these systems are underutilized with only 8% of facilities reporting clinical scans of 15 or more patients per day, per scanner. The most frequently reported MRI scans were neurological and musculoskeletal. The CAMERA NAS combined with the World Health Organization and International Atomic Energy Agency data provides the most up-to-date data on MRI

density in Africa and offers unique insight into Africa's MRI needs. Reported gaps in training, maintenance, and research capacity indicate ongoing challenges in providing sustainable high-value MRI access in SSA. Findings from the NAS and focused discussions at ISMRM and ESMRMB provided the basis for the framework presented here for advancing MRI capacity in SSA. While these findings pertain to SSA, the framework provides a model for advancing imaging needs in other low resourced settings [5)].

Malawi

Nigeria

Tanzania

Kenya

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