Neurology and Epilepsy Tales from the Ecuadorian Amazon Rainforest

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Disclosures

Faculty Disclosure:

No conflict of interests
Objectives

Educational Need/Practice Gap: Neurology and Epilepsy in the developing world.

Objectives: Upon completion of this educational activity, you will be able to: Learn about Neurology and epilepsy in the developing world.

Expected Outcome: What is the desired change/result in practice resulting from this educational intervention?

– Learn about Neurology / Epilepsy and treatment options in the developing world.
– Neurological Epilepsy Mission to the Medical Rainforest
The Magnitude of the Problem

- Epilepsy has no geographic, gender or racial distribution.
- Up to 5% of the world population has a seizure in life.
- Around 50 million people have epilepsy in the world.

Epilepsy Facts World Health Organization, available at
The Magnitude of the Problem

– 80% of people with epilepsy live in developing countries.

• CNS infections
• Lack of access to perinatal care
• Increased incidence of birth complications
• Traumatic brain injury
• Lack of specialized man power

• As many as 90 percent of patients with epilepsy in the developing world may go untreated in part due to lack of access to neurological services in these regions.

• Pharmacologic treatment for epilepsy is cost-effective, and could result in a huge reduction of the burden of disability.


Epilepsy and mortality

• Mortality rates are higher in people with epilepsy than the general population
  – SUDEP accounts for 15% of all deaths in epilepsy

• People with Drug Resistant Epilepsy (DRE) are at special risk for SUDEP
  – SUDEP accounts for 50% of all deaths in DRE

– SUDEP: Sudden unexplained death in epilepsy

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S UDDEN U NEXPECTED N EAR D EATH IN
EPILEPSY: MALIGNANT A RRHYTHMIA F ROM
A P ARTIAL S EIZURE

Cardiac arrhythmias are a well-described complication of partial seizures. During epileptic seizures, the most common finding is sinus tachycardia, found in up to 99% of patients in one series. More concerning rhythm disturbances such as bradycardia, asystole, and conduction abnormalities, while less common, have been reported in 13% of patients. The degree to which these rhythm disturbances contribute to sudden unexpected death in epilepsy (SUDEP) is unknown. We and was accompanied by muscle artifacts consistent with the tonic-clonic jerking. The entire seizure lasted 4.5 minutes. The single-lead EKG revealed tachycardia to 180 beats per minute (bpm) during the seizure. At its conclusion, there was rapid ventricular tachycardia (figure, A) degenerating into pulseless ventricular fibrillation as the seizure ended (figure, B). CPR was started, and the patient was given epinephrine, amiodarone, atropine, calcium, magnesium, D50, and bicarbonate. She was defibrillated five times. A rhythm was reestablished within 8 minutes after onset of ventricular tachycardia. Trans-
Epidemiological Data  Ecuador vs USA

• The incidence of epilepsy in the Ecuador population is between 122-140/100,000 per year.

• The incidence of epilepsy in the USA population is between 35.5-71/100,000 per year.


Mortality in Epilepsia Ecuador vs USA

En Ecuador:
SMR 6.3 (95% CI 2.0 – 10.0)

USA:
• SMR 2.2 (95% CI 1.8 – 2.7)

The Standardized Mortality Ratio (SMR) is the ratio of observed to the expected number of deaths in the study population.

Carpio et al. Epilepsia, 46(Suppl. 11):18–27, 2005
Forsgren, Hauser et al. Epilepsia, 46(Suppl. 11):18–27, 2005
Mortality due to Epilepsy in Ecuador Why?

• The Treatment Gap in Epilepsy
• Lack of access to treatment
• Lack of access to medications
• Medical Complications of Seizures
• Accidents related to Epilepsy
• SUDEP (Sudden Unexplained Death in Patients with Epilepsy)
• No Neurologist?
History of the Neurological Missions to the Ecuadorian Rain Forest

• IV International Seminar in Neurosciences 2009
• Nicole Falcone/Barbara Dworetzky/ Ed Bromfield/P.S. Espinosa.
• There are no neurologists in Tena and we have many patients with epilepsy. Let's make a Mission to Tena!
The city of Tena is located in Napo Province (pop. 90,000) in the rural Amazon region of Ecuador.

The nearest facility with neurological services is located ~200 kilometers away.

This distance and a substantial prevalence of poverty prevent patients from obtaining proper diagnosis and treatment of neurological conditions.
2009 1st Neurological Mission

THE TEAM of US and Ecuadorean health care professional seen here after flying in to Teno.
Case presentation with neuroimages
Case
Meningiomas

- Meningiomas are the most commonly reported intracranial tumor.
- They represent approximately 38% of all intracranial neoplasms in females and 20% in males.
- Meningiomas may cause symptoms by irritating the underlying cortex, compressing the brain or the cranial nerves, producing hyperostosis and/or invading the overlying soft tissues, or inducing vascular injuries to the brain.
The World Health Organization (WHO) classifies meningiomas into 3 major categories:

- Grade 1 (typical or benign), representing 88-94% of cases
- Grade II (atypical), representing 5-7% of cases
- Grade III (anaplastic or malignant), representing 1-2% of cases
Relationship between your mother in law and meningioma?
Meningiomas and mother in law

- Meningioma Mother in law sign- enhance early during the arterial phase and remain opacified well after the venous phase.
- The joke is that a mother in law comes early and stays late.
Case
Holoprosencephaly is an abnormality of brain development in which the brain doesn't properly divide into the right and left hemispheres.

- The condition can also affect development of the head and face.
- There are 4 types of Holoprosencephaly, distinguished by severity.
- From most to least severe, the 4 types are:
  - Alobar
  - Semi-lobar
  - Lobar
  - Middle interhemispheric variant (MIHV)
Case

- Holoprosencephaly
- Semi-lobar
Case Presentation

• A 32 year old man from the rural Tena Amazon region presented with severe headaches, nausea and convulsions.
Neurocysticercosis

• In the developing world, neurocysticercosis (NCC) is a common cause of acquired epilepsy.

• In Latin America alone, it is estimated that more than 400,000 persons have neurologic symptoms due to neurocysticercosis.

2012 Evaluation

• HPI: Headaches and 1 seizure every 2-3 months, however in the last month the patient had 3 seizures.
• PMH: NCC
• Meds: Carbamazepine 200 mg bid. (Received in the past 3 courses of Albendazol and Steroids).
• Physical and Neurological Examination: Normal.
• CBC/CMP are normal. Carbamazepine levels are not available in the region.
• EEG: Normal – 2012
Brain imaging demonstrating the four stages of parenchymal NCC.

A: Magnetic resonance imaging (MRI) of a **vesicular cyst**. Note the well-defined scolex, minimal contrast enhancement, and mass effect.

B: MRI of a **colloidal cyst**. Note ring enhancement, loss of the scolex, and perilesional edema.

C: MRI of the **nodular/granular stage**. Note nodule with diffuse enhancement and no cystic component.

D: Noncontrast computed tomography showing multiple punctuate **calcifications**.

Neurocysticercosis (NCC)

- Is caused by an infection of the human CNS by the larval stage of the pork tapeworm; Taenia solium.
- The most common parasitic disease of the human CNS.
- NCC is a major public health problem in the developing world as well as in industrialized countries with a high immigration rate of people from endemic countries in Latin America, Asia, and Africa.

Embryonated eggs ingested by human host

3. Oncospheres hatch, penetrate intestinal wall, and circulate to musculature

4. Humans infected by ingesting raw or undercooked infected meat

5. Scolex attaches to intestine

6. Adults in small intestine

7. Embryonated eggs and/or gravid proglottids ingested by pigs

8. Oncospheres hatch, penetrate intestinal wall, and circulate to musculature

9. Cysticerci may develop in any organ, being more common in subcutaneous tissues as well as in the brain and eyes

Eggs or gravid proglottids in feces and passed into environment

▲ = Infective Stage
▲d = Diagnostic Stage
Taenia Solium

Scolex

Tape worm
Taenia Solium

Egg

Proglottid
Porcine Cysticercosis
Human Cysticercosis

Neurocysticercosis was found in 10 percent of patients with seizures who presented to an emergency department in Los Angeles and 6 percent of such patients in New Mexico.

Deaths from Cysticercosis, United States

Frequency and percentage of fatal cysticercosis cases by state, United States, 1990–2002. Shaded areas indicate states with deaths from cysticercosis. CDC 2007.
Epileptogenesis in Neurocysticercosis

• Epileptogenesis in patients with NCC can be attributed to several factors:
  – Inflammation, Gliosis, Genetics, and predilection for the cysts to travel to the Frontal and Temporal lobes.

• The host response to degenerating cysts plays an important role in the associated epileptogenesis.

Evidence-based guideline: Treatment of parenchymal neurocysticercosis

ABSTRACT

Objective: To review the evidence base for different treatment strategies in intraparenchymal neurocysticercosis in adults and children.

Method: A literature search of Medline, EMBASE, LILACS, and the Cochrane Database from 1980 to 2008, updated in 2012, resulted in the identification of 10 Class I or Class II trials of cysticidal drugs administered with or without corticosteroids in the treatment of neurocysticercosis.

Results: The available data demonstrate that albendazole therapy, administered with or without corticosteroids, is probably effective in decreasing both long-term seizure frequency and the number of cysts demonstrable radiologically in adults and children with neurocysticercosis, and is well-tolerated. There is insufficient information to assess the efficacy of praziquantel.

Recommendations: Albendazole plus either dexamethasone or prednisolone should be considered for adults and children with neurocysticercosis, both to decrease the number of active lesions on brain imaging studies (Level B) and to reduce long-term seizure frequency (Level B). The evidence is insufficient to support or refute the use of steroid treatment alone in patients with intraparenchymal neurocysticercosis (Level U). Neurology® 2013;80:1424-1429
Antiparasitic Treatment and Seizures

- In the albendazole group, there was a 46 percent reduction in the number of seizures during months 2 to 30 after treatment.
- This reduction, which was not statistically significant, was composed of a nonsignificant reduction of 41 percent in the number of partial seizures and a significant 67 percent reduction in the number of seizures with generalization.

Treatment of NCC

• Albendazole:
  – Adults 400 mg PO BID x 10 days
  – Children 15mg/Kg PO BID x 10 days

• Dexamethasone:
  – 6 mg/day x 10 days

• Prednisone:
  – 1-1.5 mg / Kg /day x 10 days the taper
Schizencephaly

- Schizencephaly is a rare cortical malformation that manifests as a grey matter lined cleft extending from the ependyma to the pia mater.
- Schizencephaly can sometimes be bilateral, and is divided into two morphological types:
  - **Open lip**
    - the cleft walls are separated and filled with CSF
    - most common form in bilateral cases
  - **Closed lip**
    - the cleft walls are in apposition
    - most common form in unilateral cases

Schizencephaly - Pathogenesis

• Although exact pathogenesis is uncertain, it is thought most likely to be the result of abnormal neuronal migration.
• Early in utero vascular insult as the cause.
• Whether this is from an in-utero insult or the expression of genetic factors is unclear.
• Some familial cases have been reported, in which case, heterozygous germline mutations of the homeobox gene EMX2 are often encountered.

Case
Femoral neck fracture

- **Neck of femur fractures (NOF)** are common injuries sustained by older patients who are both more likely to have unsteadiness of gait and reduced bone mineral density, predisposing to fracture. Elderly osteoporotic women are at greatest risk.
  - Subcapital: femoral head/neck junction
  - Transcervical: midportion of femoral neck
  - Basicervical: base of femoral neck
EEG Case
MRI Brain Epilepsy Protocol
Temporary Lobe Epilepsy

- Temporal lobe epilepsy is the most common form of focal (partial) or location related epilepsy.
- Symptoms: feelings, emotions, thoughts, and experiences, which may be familiar or completely foreign.
- A *deja vu* experience — a feeling that what's happening has happened before
- In some cases, a series of old memories resurfaces. In others, the person may feel as if everything — including home and family — appears strange. Hallucinations of voices, music, people, smells, or tastes may occur. These features are called “auras” or “warnings.” They may last for just a few seconds or may continue as long as a minute or two.
Epileptiform Discharges: Spikes vs Sharp waves

• The difference between the spike wave and sharp wave only in its duration:
  – Spike wave duration 20-70 ms.
  – Sharp waves duration 70-200 ms.
The Epilepsy Treatment Gap - ILAE

- The epilepsy treatment gap, defined as the proportion of people with epilepsy who require treatment but do not receive it.

The Epilepsy Treatment Gap by Region


### Table 1. Magnitude of the epilepsy treatment gap by region and location

<table>
<thead>
<tr>
<th>Continent/location</th>
<th>No. of studies</th>
<th>TG (%)</th>
<th>Lower 95% CI</th>
<th>Upper 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latin America</td>
<td>7</td>
<td>55.4</td>
<td>39.0</td>
<td>78.6</td>
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<tr>
<td>Asia</td>
<td>4</td>
<td>64.3</td>
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<td>3</td>
<td>48.9</td>
<td>14.3</td>
<td>100.0</td>
</tr>
<tr>
<td>Urban</td>
<td>7</td>
<td>46.8</td>
<td>34.1</td>
<td>64.2</td>
</tr>
<tr>
<td>Rural</td>
<td>7</td>
<td>73.3</td>
<td>49.5</td>
<td>100.0</td>
</tr>
</tbody>
</table>
The treatment gap in epilepsy in Tena, Napo is 77%

2 out of 3 people with epilepsy do not receive treatment or adequate treatment.

2. Espinosa, PS. Where there are no Neurologists: Decreasing the Epilepsy Treatment Gap in the Amazon. Epilepsia, 2009 Volume 50, Issue s11 (p 328-482)
Epilepsy and drug-resistant epilepsy

ILAE Consensus Statement

• The failure of two appropriately chosen and tolerated AEDs (whether as monotherapies or in combination) to control seizures when used for an adequate period of time\(^1\)

After adequate trials of at least 2 AEDs, overall response rates with subsequent treatment trials are dramatically decreased\(^2\)

Case
Tarantulas

- Tarantulas comprise a group of large and often hairy arachnids belonging to the Theraphosidae family of spiders, of which about 900 species have been identified.

https://en.wikipedia.org/wiki/Tarantula
Case
Sloths

- Sloths are arboreal mammals noted for slowness of movement and for spending most of their lives hanging upside down in the trees of the tropical rainforests of South America and Central America.

https://en.wikipedia.org/wiki/Sloth
Case
Case
Sturge-Weber syndrome

- Facial cutaneous haemangioma (also known as port wine stain or facial naevus flammeus).
- Involves the ophthalmic division (V1) of the trigeminal nerve 4; if this territory is not involved, Sturge-Weber syndrome is unlikely.
- Majority of cases (72%) the naevus is unilateral and ipsilateral to the intracranial abnormality.
- The most common clinical manifestation is with childhood seizures, present in 71-89% of cases 2, that are often refractory to medical therapy.
- Developmental delay, hemiplegia/hemiparesis and hemianopsia.
- 1/3 of patients have choroidal or scleral angiomatous involvement, which may be complicated with retinal detachment, buphthalmos or glaucoma.
- Sturge-Weber syndrome is caused by a mutation in the GNAQ gene.

CT Scan “Tram-track” sign.

- **Tram-track sign in the brain** refers to the parallel calcification of the cortex in patients with Sturge-Weber syndrome.
Parkinson’s Disease
Case

- Subdural hygroma
- Porencephaly
- Agenesis of the vermis
- Colpocephaly?
Carotenemia

- Is a clinical condition characterized by yellow pigmentation of the skin (xanthoderma) and increased beta-carotene levels in the blood. In most cases, the condition follows prolonged and excessive consumption of carotene-rich foods, such as carrots, squash, and sweet potatoes.

- Carotenemia is a common finding in children.
Chontaduro

Bactris gasipaes is a species of palm native to the tropical forests of South and Central America. It is well spread in these regions where it is often cultivated by smallholders in agroforestry systems or, more rarely, in monoculture.
Cervical Dystonia and Hemifacial Spasm

- Hemifacial spasm, also known as *astic convulsif*, is a condition that causes frequent “tics,” or muscle spasms, on one side of the face.
- Cervical dystonia, also called spasmodic torticollis, is a painful condition in which your neck muscles contract involuntarily, causing your head to twist or turn to one side.
Embolic strokes

No CTA
No MRI
No Rapid
No neurologists
No interventionalist
Review
Congenital Cytomegalovirus Infection

- Fetal intracranial calcification: mainly periventricular calcification (hyperechogenic foci), considered on the commonest of features
- Fetal hydrocephalus
- Heterogeneous appearing parenchyma
- Microcephaly
- Intraventricular adhesions
Intraventricular neoplasms and lesions

Neoplasms of the ventricular wall and septum pellucidum
- Ependymoma
- Subependymoma
- Central neurocytoma
- Subependymal giant cell astrocytoma (SEGAs)

Neoplasms of the choroid plexus
- Choroid plexus papilloma
- Choroid plexus carcinoma
Tuberous sclerosis

- Tuberous sclerosis, also known as tuberous sclerosis complex or Bourneville disease, is a neurocutaneous disorder characterised by the development of multiple benign tumours of the embryonic ectoderm (e.g. skin, eyes, and nervous system).

Epidemiology
- Tuberous sclerosis has an incidence of 1:6000-12,000, with most being sporadic (see below) ¹.

Clinical presentation
- Tuberous sclerosis was classically described as presenting in childhood with a triad (Vogt triad) of:
  - seizures: absent in one-quarter of individuals
  - mental retardation: up to half have normal intelligence
  - adenoma sebaceum: only present in about three-quarters of patients ¹
Opsoclonus (saccadomania)

- Defined as random, uncalled-for, large-amplitude, back-to-back saccades without intersaccadic intervals. An abnormality of the omnipause neurons in the brain stem nucleus raphe interpositus has been suggested, but not proven, as the etiology of opsoclonus.
- Opsoclonus occurs with paraneoplastic, infectious, postinfectious, toxic, or metabolic disorders; however, it is often idiopathic.

Cavum septum pellucidum

- The septum pellucidum is a thin transparent membrane located in the brain between the body and anterior horns of the lateral ventricles.
- **Cavum vergae**

Case courtesy of A.Prof Frank Gaillard, Radiopaedia.org, rID: 35909
Collaboration

- We established relationship with staff and physicians of the local public Hospital Jose Maria Velasco Ibarra in Tena. Since April 2009.

- We organize annual and periodic missions. Additionally we have monthly telemedicine consultations.

- Empower the local doctors and health center to better care for their patients with neurological problems.

- Antiepileptic drugs (Carbamazepine, Phenytoin, Valproic Acid) are continuously supplied by the Ministry of Health free of charge.

- One portable EEG machine was donated.
Teaching

- Local Residents and Medical Students
- International Residents, Medical students, Premed students, College students and High school students.
Results

• Since 2009, we evaluated a total of over 2500 + patients with neurological complaints.

• A total of 600 + EEGs were performed during 10 years of the program. The rate of abnormal EEG findings in the epilepsy patients was 65%.
Telemedicine

- Video Conference
  - What’ up
  - Phone call
  - Email
Conclusions

• Since 2009 we have been able provide neurological/epilepsy care to a community where there are no neurologists.

• Our program shows that ongoing collaboration with local health practitioners in the Ecuador-Amazon rainforest can help reduce the epilepsy treatment gap in this region.
Misión Neurológica al Tena

**An Epileptologist Brings EEG to the Ecuadorian Amazon Jungle**

**BY ELIZABETH OYSTER**

Reimbursement in the Ecuadorian Amazon basin had not been the easiest for a number of years. In 2005, Dr. Robert A. Kwon, a neurologist with expertise in neuroimaging techniques, attended a forum in Quito, the capital of Ecuador, and learned about the medical needs of the indigenous communities in the Amazon region. He decided to take action and organize a medical mission to provide EEG services to the indigenous communities.

Upon arrival, the team visited several rural communities and set up a mobile EEG unit in one of the local hospitals. The team consisted of a neurologist, a EEG technician, and a few local volunteers. The mission was a success, and the local communities were grateful for the service. The mission received positive feedback from the patients and the local authorities.

The mission was a significant step towards improving the health care infrastructure in the Amazon region. It demonstrated the importance of international collaboration in providing medical services to remote areas.

Further education and training for local medical professionals is needed to ensure sustainability of the program.
Agradecimiento

- Nicole Falcone, MSc Pediabilidad
- Aaron Berkowitz, MD, PhD HMS
- Edward B Bromfield, MD, HMS
- Barbara Dworetzky, MD, HMS
- Blanca Vasquez, MD, NYU
- Sydney Cash, MD, HMS
- Ann Kao, MD HMS
- Dominc Fee, MD, UK
- Karin Swartz, MD, UK
- Christopher Shanahan, MD, BU
- Jose Cavazos, MD, UT
- Sheryl Haunt, MD, AECM
- Denise Dvorquez, MD.
- Patricio Abad, MD, HM - ILAE
- Kathleen and Bill Principe Hydrodot
- Melissa Murphy, REEG BWH
- Estudiantes del UCL
Agradecimiento

• ILAE: Visiting Professorship in Epileptology Program,
• The HydroDot® Disposable EEG Electrode Application System
• Cadwell Laboratories, Inc
• MVAP Medical Supplies, Inc.
• Rotary Club International (Westford Rotary Club Massachusetts – Club Rotario San Rafael – Ecuador)
• Centro Internacional en Neurociencias – CIEN Ministerio de Salud Publica del Ecuador
• Dirección Provincial de Salud del Tena, Hospital José María Velasco Ibarra Tena – Ecuador
• Fuerza Área Ecuatoriana FAE
• Policía Nacional del Ecuador, Clínica de Epilepsia
• Programa Nacional Integral de Epilepsia Hospital Metropolitano Quito – Ecuador
• The Edward B. Bromfield Epilepsy Program at Brigham and Women’s Hospital - Harvard Medical School
Anticonvulsivos usados en el Tena

- De los 102 pacientes que estaban recibiendo tratamiento anticonvulsivo los anticonvulsivos más usados fueron los siguientes:
  - carbamazepine 47 (44%);
  - valproic acid 26 (24%);
  - phenytoin 9 (8 %);
  - phenobarbital 6 (5 %); and
  - 4 (3%) pacientes en clonazepam, oxcarbamazepine, levetiracetam, or topiramate.
  - 13 (12%) tomaban más de un medicamento anticonvulsivo.

2. Espinosa, PS. Where there are no Neurologists: Decreasing the Epilepsy Treatment Gap in the Amazon. Epilepsia, 2009 Volume 50, Issue s11 (p 328-482)
Anticonvulsivos en el Tena

2. Espinosa, PS. Where there are no Neurologists: Decreasing the Epilepsy Treatment Gap in the Amazon. Epilepsia, 2009 Volume 50, Issue s11 (p 328-482)
Anticonvulsivos en el Hospital José María Velasco Ibarra

- Tegretol 100mg/5ml jarabe
- Tegretol 200 mg tabletas
- Tegretol 400 mg tabletas
- Valcote 500 mg tabletas
- Valcote 250 mg/120 ml jarabe
- Epamin 125/ 5ml jarabe
- Epamin 100 mg tabletas

Cortesia: Nicole Falcone, PT MSc.
OME Medicaciones Esenciales
Medicamentos Mínimos para un Sistema de Salud con Cobertura de Epilepsia

- **1985 - Esenciales**
  - Phenytoin
  - Phenobarbital
  - Diazepam
  - Ethosuximide

- **Complementary**
  - Carbamazepine
  - Valproic acid

- **2007 - Esenciales**
  - Phenytoin
  - Phenobarbital
  - Diazepam
  - Valproic acid
  - Carbamazepine

- **Complementary**
  - Ethosuximide

WHO Essential Medicines Model 2007
Economía y Epilepsia

• Salario Mínimo Vital Ecuador 2010 = 218 USD
• Costo de los AEDs:
  – Keppra 500 mg tbs  $ 3.11 x 1tb = 120 USD  1.440/a
  – Tegretol 200 mg tbs  $ 0.17 x 1tb = 40 USD  480/a
  – Valcote 500 mg tbs  $ 0.69 x 1tb = 42 USD  504/a
  – Epamin 100 mg caps  $ 0.8 x 1tb = 72 USD  864/a

Información: Fybeca cortesía Dra. Rebeca Prado
Falta de Neurólogos

• La mayoría de neurólogos se encuentran en las grandes ciudades.
• La mayoría de provincias en el Ecuador carecen de neurólogos.
• 73 Neurólogos en el Ecuador
• 1 neurólogo por 178,000 habitantes.

Sociedad Ecuatoriana de Neurología: Miembros disponible en http://www.neurologiaecuador.com/
Neurólogos en el Ecuador

- Ecuador 1 neurólogo por cada 178.000 habitantes
- Quito 1 neurólogo por 42.000 habitantes
- Napo 0 neurólogos por 91.000 habitantes

En USA:
- 4.75 X 100,000 habitantes in 2010
- Mayoría en zonas urbanas

Programa de Residencia en el Ecuador

• Postgrado del IESS en Quito con una residencia de 3 años. 2- residentes por año.
• Postgrado del H. Metropolitano estar por ser aprobado por el CONESUP en las siguientes semanas.

Comunicación personal Cortesía Dr. Patricio Abad.
Soluciones

• Educación:
  – Médicos generales, médicos rurales e internistas
  – Más neurólogos
  – Profesores y personas que cuidan a los pacientes con epilepsia
  – Comunidad para reducir el estigma y la falta de conocimiento de la epilepsia

• Utilización de los recursos al alce del país para crear programas sostenibles.

• Colaboración con líderes de la comunidad

• Sensibilidad y tolerancia a las prácticas ancestrales
Compromiso de Nuestro Trabajo en el Tena

• Mantener un proyecto sostenible
• Entrenar a los médicos pediatras, generales, rurales internistas del manejo y atención de los pacientes con epilepsia y problemas neurológicos.
• Mantener una colaboración continua con el MSP a través del Dirección Provincial de Salud y el Hospital del Tena
Financiamiento

- Donaciones de voluntarios
- Ministerio de Salud Publica del Ecuador
- Donaciones de compañías privadas
- ILAE 5K Grant
- Cuanto cuestas las misiones?

- Invalorable....
NCC Cases
Parenchymal NCC - Vesicular Phase

Enhancement MRI scans before surgery showing the cystic lesion has long T1 and long T2 signals accompanied by enhancement of the cystic wall and brain edema. (b) Enhancement MRI scans after surgery showing the cystic lesion has been resected completely. (c) The scolex extracted during surgery. (d) Histological examination of the scolex.

Cárdenas et al. BMC Neurology 2010 10:16
Bruns syndrome caused by Intraventricular NCC

A 24-year-old woman presented with 2 months of episodic vertigo, vomiting, and headache triggered by abrupt head movements, lasting from a few minutes to 1 hour. She was asymptomatic between the attacks and had mild gait ataxia on examination. Brain MRI revealed obstructive hydrocephalus and a cystic lesion in the fourth ventricle (figures 1 and 2). Her symptoms subsided after cyst excision; a histopathologic diagnosis of neurocysticercosis was made. This clinical picture matches the Bruns syndrome, due to a mobile ventricular mass producing episodic hydrocephalus on changing head posture. Cysticercosis of the fourth ventricle can be fatal and mandates prompt neurosurgical treatment.
Subarachnoid Vesicular NCC

Vasculitis due to subarachnoid colloidal vesicular neurocysticercosis in a 68-year-old man with seizures. (a) Time-of-flight maximum intensity projection image shows focal zones of mild stenosis in the left middle cerebral artery (arrows). (b) Gadolinium-enhanced T1-weighted MR image shows a cystic lesion in the left sylvian fissure with peripheral enhancement (arrow), a finding associated with stenosis.
Meningitis, Vasculitis, Stroke

Vasculitis, arachnoiditis, cerebral infarction due to neurocysticercosis in a 45-year-old man with seizures and headache.

A 23-year-old Brazilian man, a farmer in a rural area of Minas Gerais State, complained of an 8-month history of neck pain and upper-limb weakness. Flaccid tetraparesis, global hyperreflexia, and pyramidal signs were present.

Cranial CT and brain MRI were normal.

Spinal cord MRI showed an intramedullary tumoral lesion, extending from C3 to C5 vertebral bodies, with a cystic appearance (figure 1).

With a presumptive diagnosis of spinal cord tumor, the lesion was completely removed. Microscopy revealed the diagnosis of neurocysticercosis.

The patient was started on corticosteroids and albendazole with good functional recovery after 4 months.

MRI showed only residual alterations caused by the surgical procedure
Spinal Subarachnoid NCC

- The spine is commonly involved in patients with basal subarachnoid NCC, compared to those with intraparenchymal brain cysts

Callacondo et al Neurology 2012.
Imaging

A 15-year-old Peruvian girl who lived in the Andes mountains had a three-month history of headache, nausea, vomiting, and visual obscuration and a one-month history of incoherent speech, confusion, and visual and auditory hallucinations.

Treatment

The patient was treated for one month with albendazole (15 mg per kilogram of body weight per day) and prednisone (60 mg per day, with tapering of the dose at the end of the month). At a follow-up visit eight months later, the patient's recovery was found to be clinically complete, and MRI of the brain revealed resolution of the cysts.
Subarachnoidal Neurocysticercosis non-responsive to cysticidal drugs: a case series

Cárdenas et al. BMC Neurology 2010 10:16
19-year-old boy who presented with a history of headache and vomiting. No seizures.
Pathophysiology of Neurocysticercosis

Vesicular phase → Coloidal phase

Granular-nodular phase → Calcified phase

Neurocysticercosis Classification Location

- Subarchoid
- Intraventricular
- Parenchymal
- Spinal
Serology of Cysticercosis

- ELISA: 8 – 12 percent in Latin America
- Useful for identification of individuals who have had systemic contact with the parasite at some time.
- Seropositivity does not mean active systemic infection or CNS involvement

Pal DK, Carpio A, Sander JWAS. Neurocysticercosis and epilepsy. J Neurol Neurosurg Psychiatry 2000;68 137-143
• Neurocysticercosis typically is first seen either with seizures (70 to 90 percent of acutely symptomatic patients) or headache.
• Headache usually indicates the presence of hydrocephalus, meningitis, or increased intracranial pressure.
• When hydrocephalus is present, the use of antiparasitic drugs is relatively contraindicated, unless a shunt is placed before administration.
• The mortality rate of patients with hydrocephalus or increased intracranial pressure is higher than the mortality rate of patients with seizures.
Relationship between NCC and Epilepsy

There is no correlation between the NC burden of lesions and the severity of the Epilepsy.

Patients with severe refractory seizures may have only one calcified lesion; on the other hand, there are patients with multiple cysts or calcifications but not epilepsy.

Parasite location may be remote from the apparent epileptogenic region.

Epileptogenesis in Neurocysticercosis

- Patients with NCC have partial-onset seizures with or without secondary generalization.
- At the time of a first seizure, most patients have an active cyst—either a vesicular cyst or a colloidal cyst.
- New-onset seizures are commonly associated with active cysts rather than calcified granulomas.
- Chronic epilepsy is usually associated with calcified granulomas.
- Cysts that are active and undergoing degeneration (colloidal cysts) are the most epileptogenic.