Plastic Surgery in Guatemala: Opportunities in Clinical Care and Research

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Objectives

- Discuss the models for surgical missions: rural versus urban
- Review the possible scopes of practice
- Introduce the concept of a “Research Blitz”
- How to combine academic surgery with clinical research in the Third World
- Comments about surgical outcomes in the Third World.
La Raza

- Mestizo (mixed Amerindian-Spanish or assimilated Amerindian - in local Spanish called Ladino) approximately 55%; Amerindian or predominantly Amerindian, approximately 43%; whites and others 2%
Los Idiomas de Guatemala

- Spanish/Español 60%. Hay 23 idiomas indígenas (un 40%). Los más hablados son Quiche, Cakchiquel, Kekchi, Mam, Garifuna, and Xinca)
In 1996, the government signed a peace agreement formally ending the conflict, which had led to the death of more than 100,000 people and had created some 1 million refugees.
Models for Surgical Missions

- **Remote areas:**
  - Resources scarce: hospitals, doctors, equipment.
  - Majority of patients are indigenous. Spanish may not be spoken. Religions vary.

- **Urban areas:**
  - Resources more abundant. Hospitals better equipped (i.e., Blood products, Xray, Ventilators). Spanish is more common.
Guatemala: COTA 2002 - 2011

COTA- is a non profit organization dedicated to providing free surgical and medical care to both children and women in Guatemala.
Rural Areas Served by COTA
Guatemala

• Since 1996...

• Over 5000 children and families have been helped in Guatemala through the medical-surgical teams and the delivery of supplies by COTA.
COTA 2010: Retalhuleu, Guatemala

- 1,542 patients seen in the clinic in 5 days.
- 129 surgeries by 8 surgeons.
- 3,679 prescriptions filled.
COTA - 2010

- 8 Surgeons (2 Plastics, 2 Ortho, 2 General, 2 Gynecologists)
- 9 Anesthesiologists
- 3 Family Physicians
- 3 Dentists
- 3 Geneticists
- 32 Nurses
- 49 additional support staff
Multiple Beds Per Operating Room
Guatemala and Security
Moore Center in Guatemala City: CHC Supported since 2011
Moore Center in Guatemala
Scope of Practice

**Plastic Surgery**
- Cleft Lip and Palate Surgery
- Secondary Burn Reconstruction: Face and Hands
- Ear Surgery: Microtia
- Other possible components: Pediatric Surgery, Ob/Gyn, Orthopedics (club feet), Dentistry, ENT, Urology
Cleft Palate Repair
Cleft Lip Repair
Quemaduras*
Upper Extremity Burn Scar Reconstruction
Syndactyly

Left

Right
Syndactyly

Left

Right
Congenital Hand
Encephalocele and Hydrocephalus
Romberg’s Disease and Neurofibromotosis
Clefts Untreated
Untreated Wounds and Cancer
Concept of Research Blitz

- Collect a large sample of patients /subjects in a very short time (length of mission)
- Research Design used in Guatemala:
  - Expanding the Phenotype of OroFacial Clefting: Detection non-overt sign of clefting in family member not labelled as having a cleft, correlation with genetic markers
Planning Grant Goals

• To develop an international collaboration for gene mapping studies
  - Guatemala
  - Spain
  - Kenya
• To collect pilot data for long-term NIH funding.
• 50 - 100 multiplex families
• 200 nuclear triads


* Department of Human Genetics
** Division of Plastic Surgery, University of Pittsburgh
Guatemala Oral-Facial Cleft Study
January 2004

• 25 Families- 162 individuals
  – **12 Multiplex (at least 2 affected with CL±P) non-syndromic families
  – 11 Simplex (1 affected person) families
  – 2 syndromic simplex families
Guatemala Oral-Facial Cleft Study
January 2004

• **Protocol components:**
  – Demographic questionnaire and Family Pedigree
  – Blood sample for DNA analysis
  – Ultrasound of the Orbicularis oris muscle
Las familias- Los Participantes
International Planning Grant

Genetic study

• What genetic factors may cause clefting and what other features besides an overt cleft are part of the phenotype?
El Trabajo de Nuestro Equipo

• Dra. Holland hace un ultrasonido.
• Detection of occult muscle diastasis in affected family members.
Undiagnosed Left Cleft Lip and Nose Deformity
Orbicularis Oris Muscle

This muscle circumscribes the mouth. The ultrasound image (left) below shows the upper lip; the obicularis oris muscle is continuous, with no thinning. Preliminary research suggests that this muscle can be thin, or even have discontinuities in some people (right). There are no clinical manifestations of obicularis oris muscle thinning, but unaffected individuals in CL/P families may show thinning more often than controls. Thus, this may be a sub-clinical genetic marker for clefting.
Broadening the Phenotype using OO muscle analysis

- Subclinical defects of OO muscle in otherwise “unaffected” family members
- Include as “affected” in DNA analysis
- Preliminary evidence of increasing positive results for several chromosome locations
Anatomical Dissections to Correlate with Ultrasound Findings

32 unpreserved cadaver heads / lips scanned with ultrasound then dissected for histology.
Methods of DNA Analysis

- Genome-wide scan using ~400 microsatellite markers
- Fine-mapping of positive markers
- Fine-mapping in areas previously found “suspicious” for clefting locus in other populations (Asian, Caucasian...)
  - Chromosome 1 – IRF6 gene
  - Chromosome 9
Research Blitz to Spain
Pooling the Cleft Research in Guatemala, Spain, and Children’s Hospital Colorado


- No relationship between cleft laterality and handedness: Results of a large multicenter study. Submitted.

Present Focus of CHC Plastic Surgery in Guatemala: Microtia
Microtia Reconstruction:
Synchondrosis and floating rib harvested for carving
Mosaciasm and Microtia

• Definition: an individual has 2 or more cell populations that differ in genetic constitution (biopsy 2 different sites of the body and the genetics are different).

• Somatic mutation – clinical manifestations dependent on where and when in the developing fetus the somatic mutation occurs.

• The genetic etiology of microtia is unknown.
Examples of Mosaicism

- Vascular anomalies
- Neurofibromas

Could a research blitz be used to address whether microtia is caused by mosaicism?
Surgical Outcomes in the Third World: Evaluation of Techniques

• Similar problems treated with a diversity of techniques due to surgeons from across the world (i.e., The Americas and Europe).
• What can be done better?
• How do you solve some catastrophic problems?
Repair of a Bilateral Cleft Lip

Lateral Lip Elements used to form the Central Tubercle
And White Roll of Cupids Bow
Bilateral Cleft Lip Repair

Bilateral Incomplete

Intra-operative Repair

6 months Post-op.
• Bilateral Cleft Lip Secondary Deformities
• Deformities often apparent in white lip and vermillion with severe scarring and malposition.
Catastrophic Deformities - Dehisced lips with severe scarring and malposition of the premaxilla

- Due to lip dehiscence.
- Often caused by lip repair done over a projected premaxilla.

**Surgical Solution:**
- Excision of scar, Mulliken repair with possible maxillary setback.
Catastrophic Deformities - Dehisced lips with severe scarring and Need for Premaxillary Setback

Premaxilla anterior to fused and scarred lateral lips.

Section of Vomer removed to setback the Premaxilla

Post-op.
Conclusions

• Surgical Missions have a more lasting effect if you can combine the surgical work with clinical research.

• Align yourself with collaborators outside your field and equip yourself with non-surgical skills (i.e., epidemiology, research design, language).