

# Otologic Surgery Training in a Rural Ethiopian Community

Miriam Redleaf<sup>1\*</sup>, Nega Kiros Hagos<sup>2</sup>, Girma Tessema<sup>3</sup>, Yilikal Zemene Tassew<sup>4</sup>, Hanna Hailu Redleaf<sup>5</sup>

<sup>1</sup>Louis J. Mayer Professor of Otolaryngology, University of Illinois Hospital and Health Sciences System, Chicago, Illinois 60612 USA

<sup>2</sup>Dr. Nega Higher ENT Clinic, Addis Ababa, Ethiopia

<sup>3</sup>Yekatit 12 Hospital ENT Department, Addis Ababa, Ethiopia

<sup>4</sup>Mekele University College of Health Sciences, Mekele, Ethiopia

<sup>5</sup>University of Illinois Hospital and Health Sciences System, Chicago, Illinois 60612 USA

## Abstract

Despite the large number of people needing ear surgery on the African continent, otologic (ear) surgeries are few. However, safe and effective otologic surgeries are attainable via rural Ethiopian otologic surgical camps which also provide training to Ethiopian surgeons: Operations and operative results: A total of 137 otologic surgeries were performed during 4 weeklong surgical camps at a rural hospital in Butajira, Ethiopia. Most patients had large, central perforations, 94% of the operations were under local anesthesia, 26 patients from the first week's camp returned for follow-up testing. There were no complications of surgery, 83% of perforations closed completely, and 69% patients had improved hearing measured by pure tone air and bone audiometry. Trainees' experience: A total of 9 Ethiopian ENT surgeons who had previously lacked operative experience as the primary surgeon performed these operations. Three were already in practice, and 6 were recent graduates. All 3 senior Ethiopian doctors returned to their local sites and now perform otologic surgery there.

**Keywords:** Ear, Developing Countries, Hospitals, rural

## Introduction

Despite Africa's large population, ear disease remains understudied on the continent (McPherson & Swart, 1997). Otitis media has long been recognized as a significant contributor to hearing loss in Africa (A. D. Olusesi, 2008). Tympanosclerosis has been documented at an 11% rate in Tanzania (Bastos, Mallya, Ingvarsson, Reimer, & Andréasson, 1995). There is some question whether ear surgery training on the continent is adequate (Peer & Fagan, 2012). However, scattered reports of tympanoplasty success range from 71% (Becker & Lubbe, 2011) to 80% (Prescott & Robartes, 1991) to 92% (Abiodun Daud Olusesi, Opaluwah, & Hassan, 2011) and successful collaborations in tympanoplasty surgery have been reported (Wright, Walker, & Yacoub, 2007).

We present our experience as otologic surgeons serving a rural community in Ethiopia. The patients here were operated on in 4 weeklong sessions at the Garbet Eye and Ear Hospital in Butajira, Ethiopia. Financial support for the "surgical camps" was from the Garbet Tehadiso Mahber (administrative arm of the hospital) and Christofell Blinden Mission (a philanthropic organization). All operations were performed by native Ethiopian surgeons who had completed accredited residency programs in Germany and Egypt and by residents and recent graduates from the ENT department at Addis Ababa University. These surgeons were well trained in otologic pathology and surgical theory but they lacked operative experience as the primary surgeon in their surgical training. The patients who returned in follow-up demonstrate an acceptable success rate in a setting requiring little financial support after the initial acquisition of instrumentation.

## Methods

### Subjects

Garbet Eye and Ear Hospital was the site for 4 weeklong sessions of otologic surgery. Throughout the year, staff at the Hospital had previously identified surgical candidates for the surgical camps. These subjects returned for re-examination the Sundays before the start of each surgical camp. These subjects were from the local area, as well as from as far as 900 kilometers away.

## Facilities

All subjects related their history to the Garbet staff, received an otoscopic examination of their tympanic membranes, and underwent pure tone audiometry (identifying air and bone thresholds, unmasked and masked, for each ear). Operations were performed under sterile conditions using otomicroscopy, high speed mastoidectomy drills when needed, and otologic microinstruments. After an interval of months, patients returned for interval history, repeat visual examination and repeat pure tone audiometry. Oscopes, microscopes, drills, audiometers and ear instruments had been previously donated to the Hospital. The cost to the Hospital for each patient's surgery (room and board, supplies, operation) was approximately \$150 USD.

## Otologic surgery training

The otologic training was focused on primarily on increasing operative experience. A full professor of Otolaryngology/Neurotology from the Department of Otolaryngology at the University of Illinois Hospital and Health Sciences System, Miriam Redleaf, was present for all aspects of patient care. Selection of surgical cases on the Sunday preceding the surgical camp was supervised. All conversations with Dr. Redleaf were in English. In the operating theater, Dr. Redleaf was present for every operation, visually monitored the surgical sequences, and scrubbed in at some point in most operations to help. Instruction in the operating theater took the form of instant feedback to clarify what was done well, and what should be done differently. Post-operatively the patients were kept overnight and discharged the next day.

In the morning before surgery, clear specific operative goals were set for each surgeon trainee to focus on for the day. In the evenings each surgeon trainee reviewed the successes and the questions of the day's operations with the attending professor. Throughout each of the 4 weeks every effort was made to support the local surgeons' growth and confidence in otologic surgery.

\*Corresponding author, email: mredleaf@uic.edu

## Results

### Roster of operations

One hundred thirty-seven patients (age 12 to 40) underwent operations by 9 Ethiopian otolaryngologists working in the country. Eighty-seven percent of the ears were perforated (119 ears), 28% had tympanosclerosis (38 ears), 12% had cholesteatoma (17 ears). Operations were distributed as follows; tympanoplasty-112, ossicular reconstructions-12, mastoidectomy/atticotomy- 16, stapedectomy- 3, canalplasty- 1. Ninety-four percent of operations were performed under local anesthesia with sedation.

### Decision not to require second (follow-up) visit to Garbet Hospital

Due to the distance that these relatively impoverished patients had to travel, only 26 patients from the first training session returned for follow up examination and testing. None of the patients had any complications relating to their anesthesia. There were no post-operative infections. There were no instances of facial nerve weakness. When we saw the lack of complications and the burden we were placing on the patients for follow-up, we waived that requirement for subsequent surgical camps.

**Table 1. Preoperative and postoperative conditions of 26 ears repaired at a rural hospital in Butajira, Ethiopia: Otologic Surgery Outcomes in Rural Ethiopian Community**

Patient number:	Age:	Type of operation:	Tympanosclerosis?	TM closed?	Pre-Post PTA:	Subjective hearing:
1	14	Tp	no	no	-5	Same
2	15	Tp	no	yes	25	Better
3	16	Tp	no	yes	7	Better
4	16	Tp	no	yes	27	Better
5	16	Tp-OCR	yes	yes	-10	Worse
6	17	Tp	no	yes	-2	Same
7	18	Tp	no	yes	12	Better
8	19	Tp	no	yes	28	Better
9	20	Tp-OCR	no	yes	6	Better
10	20	Tp	no	no	-7	Same
11	20	M	no	yes	31	Better
12	20	Tp	no	yes	10	Better
13	20	Tp	no	yes	38	Better
14	20	Tp	no	yes	22	Better
15	20	Tp	no	yes	3	Same
16	21	Tp	no	yes	21	Better
17	21	Tp	yes	yes	15	Better
18	23	Tp-OCR	no	no	17	Same
19	23	Tp	no	yes	15	Better
20	23	Tp	yes	yes	0	Same
21	24	Tp	no	no	15	Same
22	25	M-OCR	no	yes*	7	Better
23	25	M-OCR	no	yes	3	Better
24	25	OCR	yes	yes*	9	Better
25	27	Tp	yes	yes	12	Better
26	35	Tp	no	yes	24	Better

Tp=Tympanoplasty. M=Mastoidectomy. OCR=Ossiculoplasty.

### Surgical results

Table 1 presents pre and post-operative conditions of these 26 patients' ears.

Pre-operatively, 24 had large, central perforations and 5 had tympanosclerosis. Nineteen patients underwent tympanoplasty only, two patients had mastoidectomies with ossiculoplasty, and three patients underwent tympanoplasty with ossiculoplasty while one patient underwent ossiculoplasty only. Post-operatively 20/24 (83%) had a closure of their perforations, and 18/26 (69%) had improved hearing as measured by pre-operative and post-operative pure tone air and bone audiometry (follow up time of 3-12 months). Subjective hearing improvement corresponded to audiometric improvement. Five of the 6 ossiculoplasties (using the patient's own bone instead of a prosthesis) showed improved hearing.

### Trainees' experience

The 3 senior Ethiopian surgeons reported that after their 2 weeklong supervised sessions, they were now performing operations at their local medical facilities. Evaluations were performed on the ENT residents and recent graduates and 2 of the 6 were judged competent to perform underlay tympanoplasties by the end of their weeklong training.

### Discussion

One hundred thirty-seven operations were performed, 94% were under local anesthesia. Eighty-seven percent had large perforations. Twenty-eight percent had tympanosclerosis. Previous tympanosclerosis had been reported as 11% in Tanzania (Bastos et al., 1995).

Twenty-six of the patients from the first surgical camp came for a follow up. Previous success rates in African settings in closing tympanic membranes have been reported as

ranging from 71 to 92% (Becker & Lubbe, 2011; Abiodun Daud Olusesi et al., 2011; Prescott & Robartes, 1991). All our perforations were large, central perforations. Our closure rate was 83% (20/24), with a follow-up time of 3-12 months (average 8 months). Hearing was improved on 18/26 follow-up audiograms (69%). Subjective hearing improvement corresponded with audiometric improvement. Ossicular chain reconstruction resulted in improved hearing in 5 out of 6 patients.

All 3 senior Ethiopian surgeons who participated in the first two training camps are now performing otologic surgery at their primary institutions. They each express their confidence in operating on their own. The 6 residents and recent graduates from the ENT department at Addis Ababa University are at varying levels of competence.

This report demonstrates that specialist surgery in the developing world is not a luxury (Wright et al., 2007). The Garbet Eye and Ear Hospital is supported by its administrative arm (Garbet Tehadiso Mahber) and receives contributions from the Christofell Blinden Mission, a philanthropic organization. Ethiopian otolaryngologists readily performed these operations under local anesthesia and most perforations closed with improved hearing. The cost to the facility was \$150 USD per patient. Closure rates of tympanic membrane perforations were higher than those seen in some North American populations (Redleaf, 2014).

From this experience in Ethiopia, programs like this can be inexpensive, beneficial to the population, and provide educational opportunities for the local healthcare providers. The increased confidence and skills of the local surgeons should further the amount of services available to the local population. As the local experience increases, foreign training support will no longer be needed for local healthcare.

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### Conflict of interest

The authors declare that there is no conflict of interest.

### Authors' contributions

NKH performed all post-operative evaluations and audiograms, as well as coordination of the surgical camps. Revised first draft of manuscript.

GT performed tympanoplasties and helped manage surgical camps. Revised first draft of manuscript.

YZT performed tympanoplasties and helped with surgical instruction. Revised first draft of manuscript.

HHR helped with information management.

MR wrote the first draft of the manuscript and incorporated the authors' revisions.

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