The 1st Congress of the International Society of Auricular Reconstruction

Hôpital Européen Georges Pompidou, Paris
25-27 September 2014

BOOK OF ABSTRACTS
Understanding the vascular anatomy of the auricular region enables the use of reliable flaps for auricular reconstruction. The superficial temporal artery (STA), and posterior auricular artery (PAA) are the main arteries supplying the auricle and adjacent region. The STA, ascending in front of the auricle, branches off to the earlobe, tragus, and ascending helix. It also gives off small perforators to the skin layer at various pre-auricular points (subcutaneous pedicled pre-auricular skin flap). The branch to the ascending helix gives off two sub branches: the lower sub branch traverses the helical crus and provides the conchal network (conchal floor flap), while the upper sub branch crosses the ascending helix and supplies the triangular fossa-scapha network (helical fan-out flap). Near the upper auricular sulcus, the STA interconnects with the PAA (superior auricular arterial flap); it traverses the cephalad, giving off frontal and parietal branches. The parietal branch traverses the superficial temporal fascia, reaching to about 10 cm from the upper margin of the auricle (temporal fascial flap).

The PAA emerges from the mastoid groove, then ascends under the cranial surface of the concha (inferiorly-based conchal floor flap), branching off to: the posterior surface of the auricle (post-auricular flap); the anterior surface of the concha through perforators (extended conchal arterial flap); and the mastoid region (mastoid fascia flap). While supplying the mastoid region, it gives off perforators at various points (mastoid perforator flap). The PAA ascends towards the temporal region, reaching to about 3 cm from the superior auricular sulcus.
Learning how to perform autogenous ear reconstruction continues to be a challenge. The classical surgical mentoring model has been expanded to include hands on training models and actual ear carving courses. These have been greeted with great enthusiasm.

This presentation will consist of two parts. It will include a demonstration of an app created specifically to demonstrate the step by step creation on an ear framework from an alloplastic training model. It includes written instructions, still photos and video clips of the steps necessary to be successful. Once downloaded onto an iPad, the user can use this to improve their surgical proficiency at their own speed. This app will be made freely available through iTunes U. Secondly, a video carving an ear framework using a three dimensional ear model will be demonstrated.

The model can be taken apart into the various component parts of the ear that need to be carved into order to create a complete ear framework. It can be used either for training purposes using a rib model or sterilized and used intraoperatively to help create a more accurate ear framework from costal cartilage.
EXPERIENCE IN TOTAL AND SUBTOTAL EAR RECONSTRUCTION IN 535 CASES, USING BRENT'S TECHNIQUE

Gabriel Osorno¹,²
¹Universidad Nacional de Colombia, Bogotá, Colombia, ²Hospital Universitario Clínica San Rafael, Bogotá, Colombia

Background: Since 1984, 535 total and subtotal ear reconstructions were carried out in 482 patients. Of them, 460 patients had congenital malformations, and the remaining 22 had acquired deformities.

Methods: All patients were treated with the techniques described by Brent, using sculpted autogenous rib cartilage grafts and complementary surgeries. Refinements in framework construction, tragus reconstruction for unilateral and bilateral microtia, and discrete symmetrical ear projection are emphasized. Adverse circumstances, poor results and complications are analyzed and discussed.

Results: A total of 535 ears were reconstructed in 482 patients, using autogenous costal cartilage: 378 primary reconstructions were carried out in patients with unilateral microtia, 110 reconstructions in 57 patients with bilateral microtia, and 25 secondary reconstructions in patients with microtia, and 22 in patients with acquired deformities. Follow up periods go from one to 21 years. 29 patients (6%) abandoned treatment for several reasons, 12 (2.5%) before sulcus reconstruction. Major surgical complications (hematoma, skin loss, reabsorption and infection) totalled 3.1 percent. Hypertrophic scars and keloids with serious aesthetic consequences were 5.4 percent.

Conclusions: Good and perdurable results are documented using the classic Brent’s technique for ear reconstruction. This technique is technically feasible in children aged 8-years- and older. Good results were associated with increasing experience and favorable local skin conditions. Poor results were more frequent in cases with severe microsomia, anomalies with substantial regional involvement and poor skin elasticity.
Keynote 4

25 YEARS OF AURICULAR RECONSTRUCTION IN OVER 1000 PATIENTS

Ralf Siegert, Hilko Weerda, Ralph Magritz
Prosper-Hospital, Recklinghausen, Germany

We have specialized in auricular reconstruction since more than 25 years now, have collected experiences with different techniques and developed modifications over the years. We would like to share our experiences especially with the:

- Brent based technique
- Nagata based technique
- Modifications to stabilize the retro auricular sulcus and
- Combination of auricular reconstruction with audiologic rehabilitation

Over the years a reliable technique has evolved that can be taught to residents in ENT and facial plastic surgery.
MEDPOR EAR RECONSTRUCTION: A 23 YEAR EXPERIENCE

John Reinisch
University of Southern California, Los Angeles, CA, USA

We conducted a retrospective review of all patients who had undergone Medpor ear reconstruction, between 1991 and 2013.

A total of 1042 Medpor ear reconstructions were performed. There were 977 primary ear reconstructions for microtia. 301 cases were carried out either after, or with, an ear canal reconstruction. An additional 59 were performed as a salvage procedure, for failed or unsatisfactory ear prior reconstruction and 6 were performed after trauma. The median age at the time of primary surgery was 4 years and 7 months, ranging from 2.5 to 59 years.

An early series (1993 – 1995) demonstrated high fracture and exposure rates of 25% and 44% respectively. With refinements of both the surgical technique and implant, the fracture rate has dropped to 1.5%. It was higher (8.7%) when performed in patients with atresia repair. The current early exposure rate is 4%, with late exposures less than 1%. Infection and hematoma rates are negligible. Since 1995, all but 2 surgeries have been performed as an outpatient. Salvage or prior ear reconstructions using Medpor, covered by either a temporo-parietal or occipital artery fascial flap have been successful in all cases.

This single-stage technique uses no postop drains and can be performed as an outpatient, before kindergarten without a chest or scalp scar. The ability to perform simultaneous atresia and microtia repair is a further advantage. As a salvage procedure, it is often the only acceptable reconstructive option, particularly in bilateral patients, who have had failed or aesthetically unacceptable cartilage reconstructions.
Secondary auricular reconstruction is needed due to incorrect anatomical location, postoperative hair growth, contracture of full-thickness skin (FTS), grafts utilized to cover the insufficient skin surface area of the conchal vault and for ear elevation, both resulting in an increase of tension, vascular compromise, etc. All these factors are capable of causing postoperative complications such as necrosis, resorption (deformation) and/or protrusion of the cartilage framework. During the first stage operation, the scar tissue and mismatched colored grafted skin are excised and the framework is removed. The subcutaneous pedicle flap is constructed in the posterior surface of the lobule and mastoid surface, and passed to the anterior surface of the 3-dimensional costal cartilage frame (3-D frame) to line the incisura intertragica and cavum concha. The newly fabricated 3-D frame is fixed to its proper anatomical location, covered with the temporoparietal fascia flap (TPF) followed by ultra-delicately split-thickness scalp skin (UDSTS). In the second stage operation, a cartilage block is fabricated for auricular projection and covered with the deep temporal fascia (DTF) followed by UDSTS cover.

Elevation of the reconstructed auricle with the skin graft only must be absolutely avoided since it will lead to postoperative complications and/or problems in long-term follow-ups and the results will always be a flat and floppy reconstructed auricle. The tissue expander method must also be avoided, for the same reasons.

The scientific and systematic auricular reconstruction method for secondary auricular reconstruction for unfavorable primary results with conventional methods is discussed in detail. What must be avoided?
There are a variety of options available for hearing rehabilitation in patients with ear canal atresia. These include atresioplasty, middle ear implant surgery, osseointegrated auditory implants, as well as a number of innovative transcutaneous magnetic and totally implantable bone conduction devices. In this introductory lecture, the pros and cons of these each of these options will be presented, as well as the key considerations in helping determining the most effective option for each individual patient.
Bone anchored hearing aids with percutaneous implants became the reference technique for hearing rehabilitation in congenital aural atresia. The cutaneous complications of their implant, although infrequent, remain their main inconvenience.

In order to improve the skin tolerance, the implantation techniques evolve toward implantation without soft tissues reduction. We describe the implantation of bone anchored hearing aids through a minimal punch skin resection without soft tissues reduction, nor skin incision, which shortens the surgery, improves drastically the post-operative appearance, and improves the skin tolerance.

At the same time appeared intact skin hearing aids, applicable in congenital aural atresia: middle ear implants, transcutaneous bone conduction hearing aids. We compare the hearing performances and skin tolerance of the different devices. Middle ear implants do not improve hearing more than bone anchored hearing aids. Their benefit is intact skin transcutaneous transmission. Transcutaneous bone conduction hearing aids do not always have a good skin tolerance, because of the pressure on the skin needed to be efficient.

We explain the issues of these different evolutions and devices.
**Keynote 10**

**AUTOLOGOUS ADIPOSE-DERIVED STEM CELLS AND NANOCOMPOSITE POLYMERS FOR AURICULAR RECONSTRUCTION**


1Stem Cells and Regenerative Medicine Section, UCL Institute of Child Health, London, UK, 2Department of Plastic Surgery, Great Ormond Street Hospital for Children, London, UK, 3UCL Division of Surgery & Interventional Science, London, UK

**Background and Aims:** Ear cartilage does not have the capability to regenerate, thus congenital ear deformities are typically corrected by reconstructive surgery. Scaffold cellularization for cartilage engineering can aid implant properties, their retention and minimize repeated intervention, particularly in paediatric reconstructive craniofacial surgery. Towards this goal the suitability of pediatric adipose-derived stem cells (ADSC), a readily available source of stem cells, and of two related nanocomposite polymers, POSS-PCU (non-biodegradable) and POSS-PCL (biodegradable), was explored.

**Experimental design:** Cellular and molecular techniques were used to assess: 1) suitability of paediatric ADSCs; 2) nanocomposite cellularization and bioaffinity to ADSCs; 3) hADSC chondrogenic differentiation ability in the nanocomposites; 4) whether bionanoscaffolds become encased within a vascular network and/or vascularised.

**Results:** Notwithstanding the volume of lipoaspirate available from paediatric patients is much smaller (5-10 ml) than that normally used to set up adult cultures (100-300 ml), paediatric ADSCs can be established and expanded to obtain large number of cells. Both POSS nanocomposites supported ADSC survival and proliferation and their migration and differentiation into cartilage within the nanoscaffold. Furthermore, after CAM-grafting, bionanoscaffolds were rapidly surrounded by blood vessels without any apparent negative reaction and erythrocytes of host origin were detected inside the scaffold, suggesting invasion from some capillaries.

**Conclusions:** Altogether, our studies demonstrate that ADSCs from paediatric patients represent a suitable stem cell source for autologous cell-based reconstructive surgery in children and that both POSS-PCU and POSS-PCL in combination with hADSC provide bionanoscaffolds suitable for autologous cell-based tissue engineering for clinical applications.
Keynote 11
CONSTRIC TED EARS: ANALYSIS OF 22 YEARS OF EXPERIENCE LEADING TO A NEW
CLASSIFICATION AND CORRECTIVE FORMULAS

Chul Park
The Seoul Center for Developmental Ear Anomalies, Dept. of Plastic Surgery, Anam Korea University
Hospital, Seoul, Republic of Korea

We have reviewed and analyzed 337 constricted ear cases (involving 307 patients) showing features
of helical lidding and/or cup shape that had been operated at our Center from January 1992 to
January 2014 using a variety of methods. We continued to periodically analyze the changes resulted
from our corrective methods. Accordingly, some methods were discontinued due to complications and
unfavorable aesthetic follow-up results.

Based on the collected data, we arrived at a new classification system and a new corrective formula.
Constricted ears were classified into six main groups: Group I(n=21), Group II(n=66), Group III(n=38),
Group IV(n=40), Group V(n=74), and Group VI(n=98). Our Group I through IV cases are compatible
with those in Tanzer's Group I and II. They were classified using an antihelical tubing test and a
helical-scapha push test. To correct them, either the antihelical tubing technique, the concha
cartilage tumbling flap technique, a technique of antihelical wrapping using free floating costal
cartilage, and a technique of helical expansion using free floating costal cartilage by algorithmic
approach were used. Our Group V and VI cases are compatible with those in Tanzer's Group III. To
correct them, the remnant framework was totally or near totally replaced with a costal cartilage
framework.

After corrections, a total of 243 patients (72%) were followed up between 1 month and 14 years (an
average of 21.1 months). Postoperative aesthetic outcomes were rated on a 4-point Likert scale.
MICROTIA IN THE NETHERLANDS: CLINICAL CHARACTERISTICS AND ASSOCIATED ANOMALIES

Corstiaan Breugem, Moshe KOn, Mischka Kolodzinskyi, Marie-Jose van den Boogaard, Daan van Nunen
Wilhelmina Children’s Hospital, Utrecht, The Netherlands

Background: In Europe there have been few detailed reports on the clinical characteristics of microtia patient populations. The objective of the present study is to contribute to our insight of microtia by examining the clinical features and associated anomalies.

Methods: A retrospective chart review was performed for all microtia patients referred to the Dutch Ear Center in Utrecht for reconstructive surgery of the auricle over the period 1990-2012. Moreover, all patients were requested to partake in a questionnaire to provide supplementary information.

Results: A total of 204 microtia patients (108 male; 60, 8%) were referred for reconstructive surgery during 1990-2012. Unilateral disease was observed in 91.7% of patients, affecting the right auricle in 66.3%. In unilateral patients lobule type microtia was seen in 59.9%, (small) concha type in 34.4% and anotia in 5.7%. Besides the atresia of the acoustic meatus, preauricular skin tags (30.5%), hemifacial microsomia (27.5%), facial nerve paralysis (8.3%) and congenital heart disease (2.5%). Familial occurrence of microtia was reported for 12.7% of patients, congenital deafness (11.9%), while pre-auricular sinuses and skin tags were reported for relatives of 11.0% of patients.

Conclusion: Most congenital anomalies associated with microtia in Dutch patients belong to the Oculo-Auriculo-Vertebral Spectrum. The considerable degree of familial microtia and ear malformations (> 30%) observed in this study points to a substantial genetic component in the etiology of the condition.
O-2

WHO, WHAT AND WHEN: A NATIONAL SURVEY OF ACQUIRED EAR DEFECT RECONSTRUCTION

George Murphy¹, Walid Sabbagh¹, Neil Bulstrode², David Gault³, Greg O’Toole¹
¹Royal Free Hospital, London, UK, ²Great Ormond St Hospital, London, UK, ³The Portland Hospital, London, UK

Introduction: Auricular defects arise in many ways, but the burden of disease is not well described. We performed a national survey of English subspecialist centres to determine the causes, scope of the caseload, and reconstructive options used.

Methods: We retrospectively analysed the case notes of all patients undergoing reconstruction for acquired auricular defects in England between 01/01/2010 and 31/12/2012. Patients included underwent a reconstructive auricular procedure, defined as re-shaping or importing auricular tissue, and excluding direct closure. Surgeons whose primary subspecialty interest is auricular reconstruction were included; patients treated by non-specialists or with congenital conditions were excluded. One author extracted data using a standardised pro-forma; statistical analysis was performed using Microsoft Excel.

Results: 94 patients (103 affected ears) treated by 4 surgeons were included. Mean age was 23.6 years, with 79% male and 31% female. The commonest causes were Human bites (38%), iatrogenic complications (25%) and burns (11%). Defects affected the upper third in 75%, middle third in 59% and lower third in 31% of cases. 78% reconstructions used costal cartilage. Vascularised cover required a local flap in 20%, a temporo-parietal fascia flap 15%, and a post-auricular fascia flap in 10%.

Conclusions: We provide the first objective report of acquired ear defects, demonstrating that in England this predominantly affects young men. Although human bites are the leading cause, a significant preventable caseload arises from iatrogenic treatment, most commonly a result of anterior scoring for prominent ear correction. We also demonstrate the majority of patients treated undergo costal cartilage based reconstruction.
UK CARE STANDARDS FOR AURICULAR RECONSTRUCTION- IMPLICATIONS FOR SURGICAL PRACTICE

Ken Stewart
Sick Kids, Edinburgh, UK

UK EAR MICROTIA GUIDELINES

Ear reconstruction services in the UK have developed historically based upon the volition of individual clinicians. Concern within the clinical and patient community exits regarding the stability of services, a lack of care standards and uncertainty regarding the quality of care. The intermittent emergence of small volume services and a lack cohesion between otologists and ear reconstruction surgeons have also been questioned.

Within our public health service increasing focus being paced upon auditable outcome measures and patient reported outcome measures.

In a collaboration between ENT-UK, BAPRAS, BAPA and patient support charities, interested clinicians met to discuss and debate. Evidence was reviewed and care standards for atresia and microtia have been drafted. Recommendations include a minimal referral base, minimal patient numbers, integrated multidisciplinary care and collaboration between specialist surgical centres and local services.

This paper will focus on the geography of care and the implications of our recommendations for ear reconstruction services in the UK
ABNORMALITY OF AURICULAR MUSCLES IN CONGENITAL AURICULAR DEFORMITIES

Ken Yamashita, Takatoshi Yotsuyanagi, Ayako Gonda, Asuka Sugai, Makoto Yamauchi
Dept. of Plastic and Reconstructive Surgery, Sapporo Medical University, Sapporo, Hokkaido, Japan

Background: It has been suggested that abnormality in auricular muscles plays an important role in the development of congenital auricular deformities. However, there has been no investigation to determine what muscles are involved and how the muscles affect each type of deformity. We examined abnormalities of auricular muscles during operations for patients with various types of auricular deformity.

Methods: We examined 77 auricles of 62 patients with congenital auricular deformities, including cryptotia, Stahl’s ear, protruding ear, and lop ear. The muscles we investigated were the superior auricular muscle (SAM), posterior auricular muscle (PAM) from the extrinsic auricular muscle, auricular oblique muscle (AOM), and auricular transverse muscle (ATM) from the auricular intrinsic muscle.

Results: We found characteristic features of the abnormality of the muscle for each auricular deformity. Cryptotia: In almost all cases, abnormality was found in the SAM, AOM, and ATM. Abnormal insertion in the SAM is the main cause of cryptotia. Stahl’s ear: The major abnormality was abnormal insertion of the ATM, which ran obliquely to create an abnormal cartilaginous prominence in the scapha. Prominent ear: The abnormality was clearly limited mostly to the ATM and in some cases to the PAM. Lop ear: Abnormality was mostly found in the ATM, with elongation being the main abnormality, and in the SAM or AOM in some cases.

Conclusion: There is a tendency for a specific muscle abnormality to be found in each deformity. It is important to identify the abnormal muscle and correct the abnormality during the operation.
THE GENDER OF THE EAR

Francisco Parri, Asteria Albert, Alejandro Manzanares, Maria Antonia Clavería, Jessica Correa, Aisha Khan
Hospital Sant Joan de Deu, Barcelona, Spain

Does the gender of the patient play a role in auricular reconstruction? Yes, basically in 2 complex aspects:

Epidemiologic aspect: Isolated microtia is more common in males (58-65%). Similar gender dominancy is seen in other syndromes associating microtia but in a smaller percentage (55-60%), i.e.: HFM; Goldenhar syndrome; Treacher Collins’s syndrome.

Reconstructional aspect: Several circumstances related to the gender may play a role primarily in the first surgical procedure of ear reconstruction, such as:

Presence of lobular piercing. (Removal before surgery??); previous depilation; the size of the ear for each gender or the contra lateral ear size; framework characteristics depending on the gender of the patient: intra operative placement of lobular piercing in the framework; thoracic access for cartilage extraction (sub mammary incision in female patients?) Which and how many cartilages?

Other circumstances are related mainly to the second surgical procedure: different types of auricular detachment, assessing and selecting type of scalp incision, use of fascial flap with temporal artery only in females? Skin graft donor area...

The second stage naturally builds upon the results of each individual case after the first procedure. Further modifications are performed depending on specific needs after evaluating each case, i.e.; lobular piercing, other auricular piercings, Helix, Tragus, etc.

Auricular reconstruction is an aesthetic and a psychological treatment. It aims at reaching the best possible results. To accomplish this objective, the gender consideration is an important factor too.
THE PERCEPTION OF EAR AESTHETICS: INVESTIGATION THROUGH THE USE OF A VIRAL ONLINE PHOTOGRAPHIC SURVEY

Jessica Steele, Eleanor Farmer, Fiona Perry, Justine O'Hara, Neil Bulstrode
Great Ormond Street Hospital for Children, London, UK

Aims: Few studies have assessed the aesthetics of the ear. This study aimed to assess the anatomical components of the ear that have the greatest impact on the perception of ear aesthetics.

Methods: Three photos of a male adult ear (close up, side profile, from behind) were digitally manipulated so that in each one anatomical element of the ear was either enlarged or reduced. The complete set of 16 photographs, including a repeat of the original ear as a control, were randomized and entered into an online survey that required respondents to rate the attractiveness of each ear on a scale of 1 (least attractive) to 10 (most attractive). The survey was disseminated using email and social media.

Results: A total of 248 responses were received, 155 female and 92 male. Respondents were grouped by age and occupation. Reducing (R) or enlarging (E) the helix (R p= 0.0256, E p=0.003), concha (R p= 0.0002, E p= <0.0001) and lobule (R p=0.0006, E p< 0.0001) had a significant effect on ratings of attractiveness. Altering the tragus had no significant effect (R p=0.448, E p=0.201). In side profile, raising the height of the ear had a significant effect (p=<0.0001) but not lowering the height (p=0.3038). Increasing and decreasing the projection of the ears both had a significant effect (p<0.0001).

Conclusions: This study has contributed evidence towards the anatomical components of the ear determining the greatest effect on ear aesthetics. It has also demonstrated the usefulness of conducting research using viral online surveys.
ATTENTION TO DETAIL IN SURGICAL SCULPTURE OF THE EAR

Grant A. Fairbanks, Grant R. Fairbanks
University of Utah School of Medicine, Salt Lake City, Utah, USA

Background: Great artists such as Leonardo da Vinci and Michelangelo studied human anatomy in order to be able to produce their masterpieces. The auricular reconstruction surgeon is a sculptor. To achieve good results, the reproduction of all anatomic units in their relative proportions is necessary to provide for a recognizable ear. This paper reviews external anatomy and attention to detail in the preparation of the rib graft ear reconstruction technique from an artistic standpoint. We discuss methods of pre-surgical modelling of the proposed reconstructed ear, and how this may assist in the attention to detail during surgery.

Methods: The cadaveric ear is evaluated for anatomic proportions. Castings of the patient's normal and deformed ears are made. From these castings, a model of the anticipated new ear is sculpted. As an artist uses a model to sculpt a statue, this surgical model is used to practice rib cartilage techniques for ear reconstruction with porcine costal cartilage. This experience is translated to the sculpting of the patient's new rib ear framework.

Results: Returning to the anatomy lab to study the cadaveric ear cartilage provided for concentrated attention to the anatomic units and relative proportions. Castings of patient's ears assisted in the sculpting of models of proposed new ears. Practicing with porcine rib cartilage allowed for a more realistic experience in model surgery. This experience was used in preparation to sculpt a more anatomically accurate ear framework in the operating room.

Conclusion: The ability to create an accurate ear framework is paramount to achieving optimal results. Concentrated evaluation of normal ear anatomy and practice techniques to carve the ear is invaluable in the art of this procedure. As the artist turns to the model to produce a masterpiece, so should the surgical sculptor in reconstructing the auricle. It is the attention to detail in reproducing an anatomical cartilage framework that is the most important factor for achieving successful ear reconstruction.
LEARNING CURVE IN EAR RECONSTRUCTION: DOES MORE EXPERIENCE MEAN BETTER FRAMEWORKS?

Mauricio Yoshida¹, Cristiano Tonello¹, Nivaldo Alonso¹,²
¹Craniofacial Anomalies Rehabilitation Hospital - University of São Paulo, Bauru, São Paulo, Brazil,
²University of São Paulo School of Medicine, São Paulo, São Paulo, Brazil

The main goal for auricular reconstruction is to reproduce a structure that shows an architecture most similar as possible of the normal ear anatomy.

Ear reconstruction using autologous cartilage remains the gold standard procedure once can result in exceptional outcomes in experienced hands.

The quality of the results depends on 1) precise carving of the cartilaginous framework with refined contours and 2) appropriate strategy to adapt the skin remnants to it.

From October/2011 to April/2014, 20 patients were submitted to auricular reconstruction using autologous cartilage by Firmin’s technique at Craniofacial Anomalies Rehabilitation Hospital - São Paulo University, Bauru/ Brazil by a single surgeon.

A questionnaire for each framework with its standardized photo was elaborated and send to 3 plastic surgeons (craniofacial surgeons) and 3 ENT (otologists). The survey evaluated 4 aspects of the framework: 1) proportion between the auricle structures, 2) esthetic units definition, 3) sophistication and 4) general esthetic aspect. A final score for each framework was achieved by summing the 4 specific aspects.

A trend to better results was observed with ascending linear curve for 5 of the valuers. Separating the frameworks in groups of 5 samples, it was observed for 4 of the valuers that the mean value of the last frameworks was greater than in the others periods.

We concluded that in the period of the study there was an increase in the quality of the framework accompanying the experience of the surgeon.
EARLY EXPERIENCE IN AURICULAR RECONSTRUCTION: RELIABILITY OF BRENT’S TECHNIQUE

Adriana Ramirez¹, ²
¹Universidad Nacional de Colombia, Bogota, Colombia, ²Hospital Universitario Clinica San Rafael, Bogota, Colombia

The current trend in auricular reconstruction is the gradual abandon of techniques involving three or more stages, stages by techniques involving only two stages. Independently of their choice, new surgeons in the field face the challenge of starting a learning curve with the lowest rate of complications exploiting the benefits to the selected technique.

The author presents the early experience using Brent’s techniques with mild variations. 45 ear reconstructions were realized in 42 patients, 36 with unilateral microtia, 2 with bilateral microtia and 4 patients with acquired deformities. The follow up period ranged from 1 to 87 months. No cases of hematoma or necrosis were observed in this series. Only 1 case (2.2%) became infected after the reconstruction of the retroauricular sulcus and a temporoparietal fascia flap was used for coverage of the secondary dehiscence. Hypertrophic scars and scar bands were seen in 5 cases (11%). Ancillary procedures were used in 7 patients (15.5%), 4 cases for managing low hairlines, and 3 for releasing scar bands in the retroauricular sulcus.

The series reports consistently good results and a low complication rate, stressing the value of adequate training not only in the technical aspect of carving but in the clinic approach to specific unfavorable conditions and its management.
The ultimate challenge in ear reconstruction is the "Skin" and its behaviour. This talk is about deciphering the skin factors that influence the outcomes.
USE OF THE FIRMIN TECHNIQUE IN 100 CONSECUTIVE CASES OF AUTOLOGOUS EAR RECONSTRUCTION: LESSONS LEARNT

Parag Telang
Elixir Centre for Advanced Cosmetic Surgery, Mumbai, India

Purpose: Use of autologous rib cartilage is an established method of ear reconstruction. The older method relies on four stages for complete ear reconstruction. With the use of Dr Firmin’s technique, it is possible to complete the entire reconstruction in two stages. In this study, results obtained using this technique are discussed.

Methods: Autologous ear reconstruction was performed in 100 patients from June 2011 to June 2014. The skin incisions and frameworks were used as described in the Firmin technique. The entire reconstruction was accomplished in two stages separated by an interval of 3 months.

Observations: Most of the patients had uneventful recovery. The average stay in the hospital was 5 days for the first and 3 days for the second stage. The contours seen intraoperatively were maintained in the postoperative period.

Results: The results were stable and aesthetically pleasing. There was a high degree of patient satisfaction as the entire reconstruction was completed in two stages. Two patients developed skin necrosis in the conchal bowl area and needed a secondary procedure for salvage of the cartilage.

Discussion: The results in autologous ear reconstruction can be significantly improved by the use of the Firmin technique. Since this is a surgical classification, it has great importance for the reconstructive surgeon. The author has given suggestions to modify this classification to improve its application in all cases of ear reconstruction.

Conclusions: The use of the Firmin classification helps in advancing the present state of this difficult art.
MY EXPERIENCE WITH FIRMIN’S TECHNIQUE IN AURICULAR RECONSTRUCTION

Maria Fernanda Valotta
Complex Facial Reconstruction Bazterrica Clinic, Buenos Aires, Argentina

The author has been performing Firmin’s technique for ear reconstruction since 1997. The main advantage of this method is the variation in skin approach depending on the location and characteristics of the remnant present. This allows for optimal use of local skin. Although it requires certain skills, the step by step framework carving Firmin describes is easy to learn and reproducible. A total of 36 patients have been operated on with this technique, consisting in 29 primary microtia patients, 4 secondary cases and 3 acquired deformities, with 2 major and 5 minor complications.
Most of the surgeons involved in the Microtia universe, have started initially by seeing Francoise Firmin or Nagata perform an ear reconstruction and thus tried to replicate exactly what they had seen. In my personal experience of over 200 cases I started with the procedure I first saw in 1997, and slowly modified some details according to the results I obtained. With time, I started to use the Nagata needles to fix the skin in the scafa and thus avoid bolster sutures as a possible source of ischemia. I stopped using regularly the temporalis fascia for the second stage as it did not guarantee conservation of the retroauricular sulcus. I started using full thickness grafts as they underwent less retraction, first from the inguinal region and later from the thorax. I tried to keep up with new ideas that were presented in papers and meetings and adopted reconstruction of the costal donor site with perichondrium whenever possible and presented the use of a small mastoid flap for aiding in sulcus reconstruction. My last idea is to use the dermo fat flap, left over after harvesting the skin from the thorax, turned inside to fill the void that is often visible at the cartilage donor site. I think that we can all manage to obtain a good looking ear in some cases, but from the cases we are not happy with we obtain the stimulus to evolve.
Microtia surgery is one of the most difficult and sophisticated reconstructive procedures. Following many requests by our patients and to further our interest in plastic surgery, in 2006 we introduced the treatment of these malformation at the Gruppo Otologico, Italy, founded in 1983 by Prof. Mario Sanna.

Due to the fact that our practice comprised mainly of otologic and otoneurologic surgery, microtia treatment required special efforts especially at the beginning.

The most important point is to understand the type of malformation and how to choose the most appropriate skin approach in order to face each case in the best way. The final result depends on the skin treatment and on the quality of the cartilage framework.

This reconstructive procedure is very rich in details that must be kept in mind. The knowledge of the literature and learning from capable and experienced plastic surgeon, for us ENT, has been basilar.

In this presentation we report our learning curve in microtia surgery showing how, with the experience, many mistakes have been avoided, thereby improving our results. This particular surgery requires a lot of experience which may take a long time to come by.
A NEW SKIN FLAP METHOD FOR TOTAL AURICULAR RECONSTRUCTION IN MICROTIA PATIENTS WITH A RECONSTRUCTED EAR CANAL: EXTENDED SCALP AND EXTENDED MASTOID POSTAURICULAR SKIN FLAPS

Kim Young Soo1, Yoon In Sik2
1Bona Microtia and Aesthetic Ear Surgery Clinic, Seoul, Republic of Korea, 2Department of Plastic and Reconstructive Surgery, Yonsei University, College of Medicine, Seoul, Republic of Korea

Before visiting a plastic surgeon, some microtia patients may undergone canaloplasty for hearing improvement. In such cases, scarred tissues and reconstructed external auditory canal in the postauricular area may cause a significant limitation in using the posterior auricular skin flap for ear reconstruction. In this presentation, the author present a new method for auricular reconstruction in microtia patients with previous canaloplasty. By dividing a postauricular skin flap into an upper scalp extended skin flap and a lower mastoid extended skin flap at the level of a reconstructed external auditory canal, the entire anterior surface of the auricular framework can be covered with the 2 extended postauricular skin flaps.

Between January 2012 and February 2014, the author performed total auricular reconstruction using a new method in 15 microtia patients who previously had canaloplasty. All the cases were lobule-type microtia. The time interval between the canaloplasty and auricular reconstruction ranged from 7 to 25 months (mean, 14.3 months). The postoperative follow-up period ranged from 2 to 28 months (mean, 14 months). The reconstructed ear shows good color match and texture, with the entire anterior surface of the reconstructed ear being resurfaced with the skin flaps.
Objective: To explore the curative effect of cartilage radial incisions and convolution and free auricular composite tissue transplantation for correcting moderate concha-type microtia.

Methods: From Jan 1, 2009 to Jun 30, 2012, combination of cartilage radial incisions and convolution and free auricular composite tissue transplantation were applied in 16 patients with moderate concha-type microtia.

Results: After 3 to 12 months follow-up on 16 cases, most patients were satisfied with the outcome. Complications were rare, and there was no donor site deformity.

Conclusions: The technique of cartilage radial incisions and convolution and free auricular composite tissue transplantation provides a simple and promising treatment for moderate concha-type microtia. Furthermore, this technique is easy to apply with a predictable good outcome.
OUR CONCEPT OF OPERATIVE PROCEDURE FOR LOBULE-TYPE AND CONCHA-TYPE MICROTIA

Takatoshi Yotsuyanagi, Kunitake Moroi, Ayaka Kitada, Makoto Yamauchi, Ken Yamashita, Tamotsu Saito
Department of Plastic and Reconstructive Surgery, Sapporo Medical University, Sapporo, Hokkaido, Japan

We already reported our operative procedure for lobule-type microtia (PRS 133: 111-120, 2014). Here we introduce the details of our recent operative technique for both lobule-type and concha-type microtia.

In the first stage of costal cartilage grafting, the base frame is fabricated by two cartilage blocks partly overlapped on the area of the antihelix. The thickness in the overlapping area can create a rigid structure of the frame and also emphasizes the contour between the antihelix and the helical crus by its thickness. The completed frame contains all structures of the ear including the helical crus and the tragus. For concha-type microtia, the base frame and the antihelical part are trimmed adequately to fit the remnant conchal curve, with some areas overlapping.

In the second stage of ear elevation, the ear is elevated with temporoparietal fascia underlying the cartilage frame. Scalp and neck skin behind the ear is undermined subcutaneously and lifted up cranially. It makes possible that all the grafted skin in the temporal area is hidden behind the ear. The banked cartilage is grafted on the posterior side. The auricular-earlobe angle and the shape of the earlobe should also be arranged to fit the contralateral shape. Two triangular flaps are elevated on the line cap of the cranial and caudal side, and caudal flap covers the grafted cartilage. Sometimes the mastoid fascial flap is used simultaneously. Post-auricular surface is covered by full-thickness skin from the lower abdomen.
SINGLE STAGE AUTOLOGOUS EAR RECONSTRUCTION FOR MICROTIA; 10 CONSECUTIVE CASES

Leila Kasrai1,2, David Fisher1,3
1University of Toronto, Toronto, Canada, 2St. Joseph's Health Centre, Toronto, Canada, 3Hospital for Sick Children, Toronto, Canada

Background: The authors have been using the Nagata technique since 2002. During the course of over 100 consecutive ear reconstructions, the authors’ technique has evolved. Modifications allow for greater consistency of outcome and auricular reconstruction in a single stage.

Methods: Photographs of 10 consecutive patients are presented to demonstrate the results and consistency of the technique. Surgical complication rates are discussed.

Results: One hundred ear reconstructions were performed in 96 patients. There were 75 primary cases of congenital microtia. Twenty-four ears underwent a two-stage reconstruction, and 51 ears were reconstructed with a Nagata stage I procedure or a single-stage reconstruction. There was a gradual shift in technique, with a trend to perform fewer Nagata stage II out setting procedures and more single-stage reconstructions. In patients who underwent an ear reconstruction in two stages, the surgical complication rate was 22 percent. In the last 40 consecutive ear reconstructions since abandoning the two-stage approach, the surgical complication rate is now 15 percent.

Conclusions: A modification of Nagata’s technique of autologous ear reconstruction for microtia is described. Modifications of the three-dimensional framework address the contour of the inferior crus and control tragal projection and position. Inclusion of a projection block and recruitment of retroauricular skin allow for symmetric projection of the ear in a single stage.
OPTIMAL STRATEGIES FOR AURICULAR RECONSTRUCTION IN CHINESE PATIENTS

Qingguo Zhang

1Ear Reconstruction Center, Plastic Surgery Hospital (Institute), Chinese Academy of Medical Science, Beijing, China; 2Peking Union Medical College, Beijing, China

There are 2 major methods of auricular reconstruction at present. One is the classic Nagata method. The other method is to use expanded skin flap, and in this method they used different kinds of flaps to cover the autogenous cartilage framework, including completely expanded skin and fascia flap and expanded skin flap combined with retroauricular fascia flap.

2000-2013 We did 3000 cases of auricular reconstruction, including 2000 cases of expanding skin flap combined with retroauricular fascia flap, 170 cases of expanding skin and fascia flap and 830 cases of classic Nagata.

Comparison of three methods, we found that every method have its own advantages and disadvantages. For the classic method, the procedure is simple and brief, and appropriate for patients whose retroauricular mastoid skin was thin and loose. For the method which covered the framework using expanded skin flap combined with retroauricular fascia flap, The period of skin expanding was comparatively long, and appropriate for patients whose retroauricular mastoid skin was tight.

Compared with the methods above, auricular reconstruction with completely expanded skin and fascia flap made less trauma and scar, and appropriate for patients whose retroauricular mastoid skin was thick, but took long time of skin expansion (more than 3 months). In my opinion, patients with different kinds of retroauricular skin suit different method in auricular reconstruction.
AURICULAR RECONSTRUCTION FOLLOWING HUMAN BITE INJURIES

EJ Majdak-Paredes, J Mennie, K Clapperton, KJ Stewart
St Johns Hospital, Livingston, UK

Aims: To analyse risk factors, socioeconomic background, surgical techniques and outcome in auricular human bite injuries.

Material and methods: A retrospective case-notes and medical photographs analysis were performed. Patients received PROM outcome questionnaire to assess satisfaction.

Results: 25 patients (24 male and 1 female) with post-human bite auricular defects were referred to our clinic. Mean age was 30 years (range: 18-52). Secondary auricular defect from human bite comprised lack of helix, scapha and antihelix as well as subtotal or total amputation. 17/25 (68%) decided to undergo autologous auricular reconstruction. Costal cartilage was used in all patients in stages. 2 (11.5%) patients underwent post-auricular tissue expansion and 5 (29.5%) TPF with SSG. In the remaining patients FTSG was used. 12 patients (48%) were smokers, 4 (16%) drug users and 3 (12%) alcoholic, 7 (28%) unemployed and 3 (12%) were in prison. There were no major complications or reconstruction failure. Minor complications occurred in 3 patients (12%) and comprised seroma, haematoma and infection. 2 patients underwent minor scar revision. 1 patient deceased due to psychiatric illness.

Conclusion: Despite physical and psychosocial co-morbidities, autologous auricular reconstruction following human bites is a safe procedure associated with aesthetically pleasing outcome and improved quality of life.
OSMOTIC EXPANSION OR HYALURONIC ACID TISSUE EXPANSION FOR MINIMAL STAGE AUTOGENOUS EAR RECONSTRUCTION

Andrew Greensmith
1Royal Children's Hospital, Melbourne, Victoria, Australia, 2University of Melbourne, Melbourne, Victoria, Australia

Osmotic tissue expanders in autogenous ear reconstruction have been presented as a novel idea and small case series by the senior author at the previous ISAR meeting in Sydney, Australia.

Osmotic tissue expanders have many advantages over traditional tissue expanders and allow a period of preparatory skin expansion in the region of the microtic remnant to allow a total ear reconstruction with a projecting ear in one major stage thereby obviating the need for the traditional second stage elevation procedure since a high projecting framework with a supporting cartilage block can easily be accommodated at the time of framework insertion.

As an extension of this technique the innovative application of hyaluronic acid (Macrolane) as an injectable expander is presented. This is used to significantly expand the local skin envelope over a period of 8-12 weeks prior to a definitive and one stage autogenous ear reconstruction with sufficient excess skin to accommodate a framework with a cartilage support incorporated. As a result a projecting ear is achieved in one operative stage. This represents a novel and promising use of soft tissue filler as a tissue expander and represents a true one stage autogenous reconstruction.

The author's experience with a consecutive series of 30 cases is presented. Successful outcomes consistently with this method and a paucity of problems has resulted in the senior author now using this method as his standard method for childhood/early teenage microtia reconstruction.
O-22

INCREASE OF SUBCUTANEOUS TISSUE IN MASTOID REGION IN PEDIATRIC PATIENTS WITH UNILATERAL OR BILATERAL MICROTIA, 3 AND 12 MONTHS AFTER THE APPLICATION OF AN INJECTION OF 10CC OF AUTOLOGOUS FAT GRAFTS

Claudia Gutierrez-Gomez, Guillermo Sanchez, Fernando Ortiz Monasterio T, Marcia Perez-Dosal, Eloise Ruiz, Nuria Ramirez
General Hospital Dr. Manuel Gea -Gonzalez, Mexico City, Mexico

Patients with microtia have a decrease in the thickness of the soft tissues of the auricular region, compromising the viability of the flap raised for coverage of the reconstructed cartilage framework. Increasing the thickness of the subcutaneous cellular tissue (SCT) with fat grafts, could improve the viability of the flap raised for the first stage of auricular reconstruction.

To determine by computerized axial tomography (CAT) scan the thickness obtained in the SCT at the affected mastoid region in pediatric patients with unilateral or bilateral microtia, 3 months after the application of an injection of 10cc of autologous fat grafts. An analytical study of intervention was developed, which included 5 patients. The thickness of the SCT was measured by CAT scan at three different points at the level of the longest longitudinal axis of the mastoid bone of the affected auricular region. There were injected 10cc of fat grafts in the subcutaneous tissue at the mastoid region of the affected side. A CAT scan was taken 3 and 12 months after the fat injection to re-measure the thickness of the SCT, and the finding data was compared. Five patients were studied, everyone with microtia Tanzer IIA type. A significant difference was found at the three points: point S (p=0.042), point M (p=0.043), and point I (p=0.043).

The thickness of the SCT increased at the three points with the injection of 10cc of autologous fat grafts, at the level of the longest longitudinal axis of the mastoid bone of the affected side.
THE USE OF HYALASE AND HYDRODISSECTION IN HARVESTING THE TEMPOROPARIETAL FASCIAL FLAP

David Gault¹, Alex Woollard²
¹Ear Aesthetics and Reconstruction, London, UK, ²Royal Free Hospital, London, UK

The temporoparietal fascia flap, based on the superficial temporal artery and vein, was first described in 1976. The plane between the fascia of the flap and the overlying scalp is sometimes difficult to find, often adherent and traversed by many small vessels that need coagulation. Adverse scarring after burns or head trauma can cause particular difficulty.

Errors in dissection can damage the flap or the overlying scalp to cause alopecia or delayed healing.

Since 2005, all flap dissections have been undertaken after initial hydrodissection to separate the skin from the flap. A total of 50mls of Hyalase, Saline, Lignocaine and Adrenaline are infused. Between 2005 and 2014, 40 TP flaps have been raised using this technique, of which 29 were in males (72%) and 11 in females (28%), with ages from 9 and 52 years.

Hydrodissection saves at least 20 minutes of surgical time, enabling safer dissection of tissue planes and more reliable preservation of key local structures, and converts an onerous burden to a more rewarding task.
Purpose: Use of the temporo-parietal fascia in ear reconstruction is well documented.

Occipital fascia is a random pattern fascia. In this study the author describes various applications of this fascia.

Methods: Occipital fascia was used in first and second stage ear reconstructions in 15 patients from April 2011 to April 2013. The main use was in sulcus creation to cover the cartilage placed behind the framework. In 3 cases it was used to cover exposed cartilage after temporoparietal fascia was used up.

Observations: There was complete survival of the flap in 15 cases. In 2 cases, there was partial flap loss. In one patient there was complete flap loss and patient had to be sent for prosthetic rehabilitation.

Results: The overall shape obtained after complete healing of this flap was satisfactory. It gave good support to the cartilage framework when used to create the sulcus.

Discussion: The fascia allows a lot of flexibility of design due to its broad based blood supply. This being a local flap, the need for a separate scalp incision is eliminated. The temporoparietal flap does not cover the inferior portion of the framework effectively. This fascia is a lifeboat for these difficult areas.

Conclusion: Occipital fascia is very useful as the ultimate lifeboat in salvage procedures and in creation of post-auricular sulcus.
Release of the reconstructed ear is a challenging aspect of auricular reconstruction, with no consensus on the best approach. Techniques primarily comprise advancement of neck skin with a skin graft, a small cartilage block in a fascial tunnel and a cartilage block covered with mastoid fascia or temporoparietal fascia (TPF). To guide technique selection a scoring system was developed which assessed six domains: projection, depth of sulcus, uniformity, graft quality, mobility and donor site. Weighted scores were assigned to each of these and Patients were also asked to rate their overall satisfaction.

 Thirty patients were assessed with a minimum 6 months follow up. Skin advancement with a skin graft provided predictable scores with high patient satisfaction. These had poor projection but good sulcus depth and mobility. The use of the fascial tunnel and mastoid fascia to cover a cartilage block yielded better projection in some cases but there was a significant number of retractions and loss of sulcus. The use of a more substantial block carved to simulate the conchal support covered by TPF produced the best outcome.

Consequent to this preliminary study the author's preference is either skin advancement and skin graft or a cartilage block with TPF. The former is relatively simple, predictable with consistently good results. The latter is more complex requiring considerably more theatre time (often with harvesting of further rib cartilage) but results in better projection. Appropriate technique is selected depending on the appearance of the contralateral ear, patient's motivation and anatomical features.
Patients with congenital tragal deformities accompanied by dystopic cartilage growth (accessory tragus) show not only a disfigured or absent tragus (causing a wholly exposed external opening of the auditory canal), but also an unnecessary pre-tragal lump. Few descriptions concerning reconstruction for such cases are available in the prevailing literature.

We analyzed the surgical methods and postoperative outcomes (using medical records and photographs) of 65 ears (involving 54 patients) that had shown congenital tragal defects accompanied by dystopic cartilage growth before reconstruction from March 1991 to February 2014. Six kinds of tragal framework construction methods were used: a free cartilage grafting technique (seven ears); a cartilage transposition technique (seven ears); a cartilage folding and anchoring technique (47 ears); a chondrocutaneous arterial flap technique (three ears); and a costal cartilage grafting technique (one ear). Immediate postoperatively, four cases showed congestion of the covered skin. Forty-three patients (77.8 %) were followed up for an average 15.2 months. Bigger tragus (n=3), flat tragus without peak (n=2), protrusion of posterior tragal wall (n=2) and hypertrophic scars (n=1) were observed. All cases with wholly exposed external openings of the auditory canal were completely corrected. The average aesthetic outcome score, rated on a 4-point Likert scale (1=poor, 2=fair, 3=good, 4=excellent) was 3.8 points.

The cartilage and covered skin of the dystopic cartilage growth provided the best available tissues for new tragal reconstruction. The cartilage folding and anchoring technique provided an effective tool for their aesthetic reconstruction.
A NOVEL METHOD OF NATURALLY CONTOURING THE RECONSTRUCTED EAR: MODIFIED ANTIHELIX COMPLEX AFFIXED TO GROOVED BASE FRAME

Ruhong Zhang, Qun Zhang, ZhiCheng Xu, DaTao LI, Feng Xu, Yiyuan Li
Shanghai 9th People's Hospital, School of Medicine, Shanghai JiaoTong University, Shanghai, China

Background: Prior reports of ear reconstruction have cited favorable results. Although greater attention has been devoted to fabricating a more refined cartilaginous framework, many patients still complain that the contours are unnatural. The authors’ aim was to offer a new technique that resolves some lingering issues.

Methods: To fabricate the antihelix complex optimally, the authors modified an existing method. Rather than chiselling a sharp, Y-shaped graft of cartilage for structural prominence, the superior crus is broadened, and a gentle slope is sculpted on both aspects. Simultaneously, a groove in the base frame is carved for smooth attachment. The width of the inferior crus is limited to roughly one-third that of the superior crus, and the inferior crus is maintained in high relief. A gentle slope is shaped on the antihelix, and a groove for placement of the antihelix is carved into the base frame.

Results: Between 2011 and 2013, a total of 162 patients underwent reconstruction using this modified technique. Three such subjects have been selected to highlight the favorable results achieved. Given modifications confer natural contours to superior and inferior crura, antihelix, and surrounding structures, providing a cohesive framework for the integrity of a reconstructed ear.

Conclusions: The antihelix complex is critical for creating a natural auricle. Harmonious integration of superior and inferior crura and antihelix enhances the overall aesthetics, increasing procedural satisfaction for patient and surgeon alike.
O-28

RETROAURICULAR ISLAND FLAP, AN ALTERNATIVE TECHNIQUE FOR A RARE TYPE OF MICROTIA. CASE REPORT

Carla Florin¹,³, Carmen Morovic²,³
¹Hospital Dr Sotero del Rio, Santiago, Chile, ²Hospital Dr Luis Calvo Mackenna, Santiago, Chile, ³Clinica Las Condes, Santiago, Chile

Introduction: The reconstruction of the ear in Microtia still remains as a challenge for the Plastic Surgeon. On top of that, the remnant can be partially formed and the decision of what to reconstruct becomes crucial.

We present a case with a type of microtia, which involves the conchae area mainly. Based on the hypoplastic portion of the ear, we performed the auricular reconstruction using cartilage framework and a retroauricular island flap.

Patient: 11 years old girl with a left isolate microtia. The characteristics of her remnant are a well formed superior half ear with helix and antihelix but absence of tragus-antitragus complex, no conchae and a displaced hypoplastic lobule.

Surgical Technique: On the first stage, having decided the new position of the lobule, a retroauricular island flap was designed. A transfixion incision on the remnant was made and the lobule was rotated to a new position. The island flap was transposed to reconstruct the conchae. Costal cartilage was harvested and positioned to keep the continuity of the helix and a skin flap was used to cover the cartilage graft. Two drains were placed for 5 days and sutures were removed at 10 and 14 postoperative days.

Conclusion: The retroauricular island flap is an easy, simple and reproducible technique, which is a good alternative to reconstruct the conchae.

In this case, the main deformity was the absence of the conchae therefore, the island flap allowed us to reposition the lobule and re-create the conchae space without tension.
THE DIGITAL SOLUTIONS FOR MICROTIA PROSTHESIS

Wang Kai
Zhabei Central Hospital, Shanghai, China

Objective: The preparation of auricular prosthesis was an optimal treatment for the patients with microtia, when they were unacceptable to the surgical treatment. And they could obtain aesthetically pleasing effect by pasting. The process could be optimized by digital solutions for improving the simulation of prosthesis, while shortening the production cycle.

Background: Omitted

Method:

1- A hearing data form was established for patients with microtia. The files form should include physiology, psychological assessment and hearing requirement.
2- CT scanning in temporal bone was a way to determine the possibility of planting, and it could be a basis to decide that the implant location. If possible, the implant surgery should be completed for the osseointegration.
3- Through scanning and mirrored-copy, the three-dimensional modelling of deformed auricular was built by software. In accordance with the laws of Boolean operations, the basilar part of the auricle was designed to contact to the temporal bone.
4- A wax auricular was sculptured by CNC in the temporal bone. The gypsum moulage of prosthesis was made after manual revision from wax mould.
5- A silicone prosthesis was print from gypsum moulage, and it was connected by clips or fixed by pasting to achieve wear.

Discussions:

1- The result shows a digital solution for shortening the original engraving from 4-5 hours to 1 hour.
2- The application of 3D technologies increased the degree of simulation of prosthesis.
3- The copy of auricular prostheses made easier to meet the psychological needs of microtia patients.
THE ROLE OF OSSEOINTEGRATED AURICULAR RECONSTRUCTION IN PATIENTS WITH A COMPROMISED IPSILATERAL SUPERFICIAL TEMPOROPARIETAL FASCIAL FLAP

Kevin Zuo¹, Gordon Wilkes²
¹University of Alberta, Edmonton Alberta, Canada, ²University of Alberta, Edmonton Alberta, Canada

Purpose: Patients with major ear deformities and compromise of the superficial temporal artery and fascial flap are poor candidates for autogenous reconstruction. Osseointegrated prosthetic ear reconstruction is an alternative to contralateral free TPFF reconstruction. We evaluated the indications, outcomes, and patient satisfaction with this procedure.

Method: We reviewed the charts of patients with ear loss or major deformity and a compromised superficial temporal artery who underwent osseointegrated prosthetic ear reconstruction from 1989-2013. Patient satisfaction was assessed using a questionnaire based on a 5 point Likert scale.

Results: The ipsilateral superficial TPFF was compromised in 32 patients due to major trauma (17), cancer extirpation (9), previous harvest (5), or arteriovenous malformation (1). All but 2 patients had an associated craniofacial defect such as soft tissue deformity (87.5%), hearing loss (46.9%), and bony deformity (31.3%). 7 patients underwent prior head and neck irradiation. Overall implant success rate was 87.5% at mean follow up 7.6 years after surgical installation. Prostheses were worn on average 12.2 hours/day and 6.6 days/week (80.5 hours/week). All 5 patients who experienced implant failures had received prior radiotherapy. Questionnaire response rate was 53.1% (17 patients). With their prosthesis, 76.4% (13 patients) stated that their self-consciousness in public was "better" or "much better," while 58.8% (10 patients) stated that their outlook on the future was "better" or "much better." All patients declared they would go through the treatment again.

Conclusion: Osseointegrated prosthetic ear reconstruction is a reliable option for this challenging patient population.
DEVELOPMENT OF A NEW PATIENT REPORTED EXPERIENCE AND OUTCOME MEASURE FOR USE IN AURICULAR RECONSTRUCTION; THE EAR-PEOM

Joanna Mennie¹, Suzanne McDonald², Catriona Moffat², Kerr Clapperton¹, Ken Stewart¹
¹Department of Plastic Surgery, Royal Hospital for Sick Children, Edinburgh, UK, ²Paediatric Psychology and Liaison Services, Royal Hospital for Sick Children, Edinburgh, UK

Background: Patient reported experience and outcomes are indicators of quality. The results can facilitate benchmarking, reimbursement and drive quality improvement. Our aim was to develop and validate the first patient reported experience and outcome measure for use in auricular reconstruction.

Methods: Qualitative methods including patient interviews, literature review, and expert opinion identified core domains and questionnaire items. Pre-testing in 32 patients was undertaken followed by cognitive debriefing and item reduction. The reduced measure was field-tested in 114 post-operative and 24 pre-operative patients from one unit. Acceptability, reliability, responsiveness and validity were assessed using recommended guideline criteria.

Patient responses were then qualitatively analyzed. Indication and gender were tested against outcome using unpaired t-tests. Age and level of anxiety/depression were assessed using Spearman correlation, and date of first surgery using Pearson's correlation method.

Results: Our measure, the Ear-PEOM, included a total of 4 domains; ‘psychosocial behaviours’, ‘aesthetics and function’, ‘satisfaction with care and information received’, and ‘choice of management’. The Ear-PEOM proved reliable (Cronbach’s alpha 0.96), responsive (Effect size 1.48), and valid (Item-total correlation 0.79, Spearman correlation 0.89).

Microtia patients scored lower than patients with acquired defects in the ‘aesthetics and function’ domain only, p=0.022. Date of first surgery correlated significantly with outcome, p=0.018. Age, gender and anxiety/depression did not impact on outcome.

Conclusion: The Ear-PEOM can be used to assess the quality and responsiveness of care in auricular reconstruction patients. The Ear-PEOM provides a platform for standardized outcome and experience reporting that can drive quality improvement and enable direct benchmarking.
Problem: There is great concern in the medical-surgical setting because patients undergoing costal graft present in the postoperative pain of great intensity. In the last 3 or 4 years we have made the art of rejecting the muscle toward the midline, without cut it.

Objectives: To evaluate the postoperative pain by pressure algometry and scale of faces, in patients randomized to two different surgical approaches for costal cartilage.

Hypothesis: If the art of preserving the integrity of the anterior rectus abdominis in making costal graft is better than the usual technique where the muscle is cut.

Methodology: The clinical trial will consist of two randomized groups of patients:

Group A: measure their threshold to 24 hours before surgery, there will be a surgical approach respecting the anterior rectus abdominis.

Group B: measure your pain threshold (algometry) 24 hours before surgery, the surgical approach is sectioning the anterior rectus abdominis

Results: 35 patients, 17 cut muscle, not cutting muscle 18. Student t test for independent samples, scale faces 30 days (0.28) 60 days (1.0), 90 days (0.81), algometry 30 days (0.925), 60 days (0.910) 90 days (0.932).

Conclusions: We detect and control our main confounding variable in both surgical techniques to prevent damage to the intercostal nerves with sub-pericóndrico approach. No treat our patients with intraoperative bupivacaine. We found no statistically significant differences by algometry and Faces scale to measure postoperative pain between the two surgical techniques.
EVALUATION OF THORACIC DEFORMITIES AND RESPIRATORY PATTERNS SECONDARY TO COSTAL CARTILAGE HARVESTING FOR EAR RECONSTRUCTION

Johnatan Figueroa1,2, Claudia Gutierrez1,2
1Hospital General Manuel Gea González, Mexico City, Mexico, 2Universidad Nacional Autonoma de México, Mexico City, Mexico

We present an analytical ambispective analysis of patients who were operated for ear reconstruction with costal cartilage in a period from January 2005 to January 2013. 51 patients were studied (26 male) after ear reconstruction with costal cartilage grafting of one or both sides of the chest. Everyone had clinical and tomographic evaluation with a thoracic deformity report. Previously we sought concordance between clinical and tomographic analysis by Kappa index, which resulted in 0.310. We found that clinical evaluation detects only 30% of the deformities diagnosed by CT.

Spirometry was performed at least one year after the procedure. The median age was 14 years. We chose patients with CT deformity report, we exclude patients with pre-existing respiratory conditions, obese or smokers. Any restrictive pattern was taken as abnormal. Depletion of total lung capacity (TLC) was confirmed by plethysmography in patients with restrictive patterns. We take as reference volumes below the 80th percentile.

Conclusion: 21% had restrictive pattern on spirometry. 23% were identified with asymmetry during inspiration in clinical evaluation, 4 of whom had impaired spirometry compatible with restrictive pattern. No differences in forced expiratory volume in one second (FEV1) and the FEV1/FVC ratio in this group were found, but there is significant association between a low forced vital capacity (FVC) and restrictive patterns (p = 0.000). Difference in gender did not represent significance. Furthermore, cartilage harvesting of both sides of the thorax causes a greater deformity and restricted patterns in spirometry (p = 0.021).

Key words: Ear reconstruction, ear anomaly, chest deformity, costal cartilage, spirometry.
Introduction: Long-term symmetry in size is an important goal when performing ear reconstruction from autologous rib cartilage. The optimal age for surgery and sizing of the framework is still under debate as it is not known if the reconstructed ear grows. The objective of this study was to determine if the reconstructed ear changes in size and compare this with the normal ear.

Method: Twenty-two patients were selected in this retrospective study. Digital morphometry was used to measure the length of the reconstructed and normal ears. A first photo had been taken after the reconstruction at a median of 11.2 (range 8.0-12.5) years of age and a second photo at a median of 16.3 (range 14.5-21.6) years. The median follow-up time was 5.6 (range 2.1-10.6) years. The differences between the photos were calculated and paired student's t tests and Mann Whitney U tests were used for the analysis.

Results: The length of the reconstructed ear had increased with 0.62 cm (95% CI 0.43-0.81) and that of the normal ear with 0.53 cm (95% CI 0.38-0.68). There was no significant difference between the growth of the normal and reconstructed ears (p=0.26).

Conclusions: The reconstructed ears grow during the studied time interval. This is most likely due to growth of the actual cartilage. There is no significant difference of the growth on the reconstructed and normal sides.
POOR COUSIN EAR LOBE

David Gault
Ear Aesthetics and Reconstruction, London, UK

The ear lobes are often seen as the poor cousin of the ear. They may be prominent, too small or large, "tired", droopy, damaged by jewellery, trauma and radiotherapy and malpositioned by ear and facelift surgery. Although they are generally part of the ear most on show, requests for surgery are often seen as trivial and attempts poorly judged.

Tethering a prominent ear lobe can indeed be difficult, and combination of suture and skin excision may be required. A series of interdigitating flaps can render a cleft lobe smooth, and fill in teenage megaholes for rising executives. A "tired" earlobe can be rejuvenated with a combination of reduction, excision of old piercings and in some cases a mastoid hitch.

A panoply of techniques for old and new lobe problems is presented.
COMPLICATIONS IN AURICULAR RECONSTRUCTION

Jorma Rautio
Helsinki Cleft and Ccraniofacial Centre, Helsinki, Finland

Material and methods: 200 auricular reconstruction. 109 Males and 84 females, average age 14 yrs. Etiology: Marx 3 135, Marx 2 48, trauma 16, tumour 1. Complications were minor, if easy to correct, and major, if they caused more extensive revision and morbidity.

Results: There were 34 patients with local complications (17 %). 12 were classed as major (6 %), 22 as minor (11 %). There was one general complication. One girl aspirated, and needed ICU treatment.

The 22 minor complications were usually small dehiscence’s of skin edges that.

12 major complications (average age 22):

- 3 pat dehiscence of the wound caused by removal of the skin remnant overlying the deformed cartilage in lobular type microtia.
- 1 pat. a large skin necrosis over the concha.
- 1 pat. adult male Marx 2 microtia led to hematoma and infection and subtotal loss of frame.
- 1 pat. no antibiotic and suppurative infection
- 2 pat: bolsters in the scapha led to problems.
- 2 pat were adult males with subtotal traumatic amputation of the auricle and poor healing in lower scapha.
- 2 pat adult females, where excessive thickness of the frame caused tenting of skin over scapha.

Conclusions:

1- Remember prophylactic antibiotic.
2- Avoid making the frame too thick especially in adults
3- Careful with bolster suture
4- Previous scarring, and age of over 20-30 is a risk.
THE TREATMENT FOR STAGE 2 POSTOPERATIVE COMPLICATIONS OF EAR RECONSTRUCTION WITH BADACHU METHOD

Leren He, Lin Lin, Yongzhen Wang, Haiyue Jiang
Plastic Surgery Hospital, Chinese Academy of Medical Sciences, Peking Union Medical College, Beijing, China

Objective: To explore the treatment of stage 2 postoperative complications of ear reconstruction with Badachu Method.

Method: Review the 953 ear reconstruction surgery with Badachu Method we performed during the last two years. Analyze all the postoperative complications of stage 2 surgery and describe the corresponding treatment methods.

Result: 1, hematoma under skin flap, 5 ears (incidence rate 0.52%) were cured completely in all cases; 2, the unhealthy blood circulation at the edge of skin flap, 26 ears (incidence rate 2.73%), were cured completely in all cases; 3, partial badness of skin graft, 35 ears (incidence rate 3.67%), were cured completely in all cases; 4, exposure of cartilage framework, 11 ears (incidence rate 1.15%), light 8 area ears (0.83%), severe 3 ears (0.32%), were cured with little damage of the new ears; 5, the framework infection, 3 ears (incidence rate 0.32%). 1 ear were cured completely, while the shape of 2 ears distorted seriously.

Conclusion: The common complications post stage 2 surgery of ear reconstruction with Badachu Method were unhealthy blood circulation at the edge of skin flap and partial necrosis of skin graft (6.41%), which were cured with external used medicine and didn’t damage the shape of reconstructed ears; The severe complications was cartilage framework exposure (1.15%), which needed to be treated with operation and had mild damage to the new ears; The disastrous complications was cartilage infection, which damaged seriously the new ears; the complications needing to deal with urgently was hematoma, which didn’t influence the proceeding and outcome of the whole surgery.
CARTILAGE EXPOSURE FOLLOWING AUTOLOGOUS MICROTIA RECONSTRUCTION: A TREATMENT APPROACH TO MAINTAIN GOOD COSMETIC OUTCOMES

Neil Bulstrode, Sabrina Cugno, Naguib El-Mutardi
Great Ormond Street Hospital, London, UK

Background: Successful reconstruction for microtia involves fabrication of a cartilaginous framework and provision of thin durable soft tissue coverage that replicate the intricate contours of the auricle. Breakdown of the skin envelope can lead to exposure of the cartilage, with resultant cartilage resorption and distortion of the ear construct. Our approach to this complication minimizes the effect of exposure and maintains cosmetic outcome.

Methods: Patients operated on by a single surgeon (NWB), April 2006 - September 2012. Details related to timing, location, size and management of cartilage exposures were collected.

Results: A total of 206 patients underwent autologous microtia reconstruction (median age at first stage, 11.4 years), 16 patients were identified that had exposure of the cartilaginous ear construct. All exposures occurred following the first stage of reconstruction (mean of post-operative day 29, range, 7 – 86 days), and concurrent infection of the area was noted in one case. One of the patients also developed cartilage exposure following the second stage of reconstruction. Large areas of exposure (> 10 mm²) required surgical management, with debridement and cutaneous or fascial flap coverage, depending on location relative to the contours of auricle and adjacent tissue mobility. Areas < 10 mm² were managed conservatively. All exposures were successfully treated without adverse sequelae to the final aesthetic outcome.

Conclusion: Cartilage exposure following autologous microtia reconstruction can be a devastating complication if not addressed in a prompt and effective manner. This management strategy provides a concise approach to maintain good cosmetic outcomes.
MINIMIZING INFECTION IN AURICULAR RECONSTRUCTION - TECHNIQUE MODIFICATIONS

Yvonne Brakovsky
Inkosi Albert Luthuli Central Hospital - Department of Plastic and Reconstructive Surgery - Senior Consultant, Durban, South Africa

Background: Infection is a recognized complication of auricular reconstruction and an ever-present threat in an African environment.

Additional technique modifications were introduced by the author in an attempt to minimize infection rate:

1- Identification / preservation of skin perforator in the conchal area.
2- Framework fenestration
3- Packing the auditory canal with antiseptic ribbon gauze
4- Sealing the suture line with dermal glue

Methods: Retrospective review of the notes of 18 consecutive patients undergoing 1-st stage autologous auricular reconstruction before the introduction of the above technique modifications (Group A) and review of the notes of 17 following, consecutive patients (Group B) whose surgery utilized these techniques.

Results: Infection rate in group A: 11.1% (2 patients)

Infection rate in group B: 0%

There were 2 patients in group A and 1 in group B with minimal skin loses and no signs of infection. All these healed with dressings only.

There appear to be a good vascular ingrowth in the framework fenestrations (photographs available)

Conclusions: Additional precautions / technique modifications appear to decrease infection rate in stage 1 auricular reconstruction.
BORDERLINE CASES IN EAR RECONSTRUCTION

Maria Fernanda Valotta
Complex Facial Reconstruction Bazterrica Clinic, Buenos Aires, Argentina

In some patients, usually in secondary and complex cases, choosing a good surgical plan is not an easy task. In this cases, experience plays a major role in the final decision whether to use local skin, facial flaps or external prosthesis. Three cases are presented and subject to debate: one burn sequelae, a secondary ear reconstruction and a patient with previous reconstruction of the ear canal.
SECONDARY SALVAGE OF THE UNSATISFACTORY MICROTIA RECONSTRUCTION

John Reinisch¹, Francesca Jahns², Ali Rope³
¹University of Southern California, Los Angeles, California, USA, ²Cedars-Sinai Medical Center, Los Angeles, California, USA, ³Tulane Medical School, New Orleans, Louisiana, USA

Microtia reconstruction is a relatively uncommon and notoriously difficult procedure. As a result, there are many patients who are disappointed with the final outcome of their microtia reconstruction. This paper describes our experience with secondary reconstruction of patients with unsatisfactory or failed initial ear reconstruction.

All patients having salvage surgery for prior unsatisfactory microtia reconstruction were reviewed. Demographic data and outcomes were assessed.

Between 2002 and 2013, 61 patients were identified. Patient’s age at the time of the secondary reconstruction ranged from 7 to 58 years. Salvage surgery was done 6 months to 51 years after the initial microtia surgery in patients that ranged from 7 to 58 years of age. There were 17 female and 44 males patients. Prior reconstruction utilized rib cartilage in 41, Medpor implant in 14 and prosthesis in 6 patients. Medpor implants were used for salvage in all patients. The implant was covered with arterial flaps of temporal fascia in 34 patients, occipital fascia flaps in 26 patients and radial forearm fascia flap in 1 patient. Two patients required fascial free flaps. There were complications in 7 patients requiring additional surgery. All patient reported increased satisfaction with their ear reconstruction following the secondary salvage procedure.

Representative examples of secondary procedures for prior unsatisfactory ear reconstruction will be shown.
SECONDARY RECONSTRUCTION AFTER UNFAVORABLE MEDPOR AURICULAR RECONSTRUCTION

Kai Chieh Chan, Zung Chung Chen, Hsuan Keng Yeh
Chang Gung Memorial Hospital, Taoyuan, Taiwan

High density porous polyethylene, commercially available as Medpor, has provided an effective alternative for constructing an auricular framework for its being a stable, inert substance while malleable, transforming in hot water. When talking about Medpor implant, exposure remains one of the major concerns. Temporoparietal fascia flap coverage and one-stage operation are suggested for Medpor, in that situation, skin flap was divided at the helical rim. Circulation coming from the posterior pedicle was divided, so wound healing won't be as reliable as staged operation. Contracture and thick scar problem may happen. The contour then may not be clear in detail. Those are the most common condition while patient search for second opinion. 12 Patient receiving Medpor surgery with unfavorable result were review from 2007 to 2012. Patient presentation and treatment solution were reviewed.

From 2007 to 2012, 13 patients receiving Medpor implantation for microtia reconstruction with unfavorable result asking for second opinion in Chang Gung Memorial Hospital were reviewed. The treatment goal include wound healing only, improve daily care and improvement of total profile, depends on the patient's desire.

Both Medpor and costal cartilage could provide good result as substitute of ear cartilage while each operation possess the unique character. However, each material could provide alternative choice for the patients. Once unfavorable result occurred, we should be able to provide solution for the patient depends on patient's opinion.
UPDATE ON SECONDARY EAR RECONSTRUCTION USING THE EXISTING TISSUE ENVELOPE

Grant A. Fairbanks, Grant R. Fairbanks
University of Utah School of Medicine, Salt Lake City, Utah, USA

Background: Primary reconstruction of the external auricle is one of the most challenging procedures in plastic surgery. Salvage procedures for failed results only increase the level of difficulty. Limited discussion is found in the literature regarding techniques for secondary ear reconstruction. Previously, we have presented our results with patients who underwent secondary ear reconstruction using autogenous costal cartilage and the existing tissue envelope. We present our evolving experience with eight cases using this technique.

Methods: Eight cases of secondary ear reconstruction were reviewed. In each case the original framework was removed and replaced with a newly sculpted cartilage framework at the same operation. Each case was evaluated for complications and aesthetic quality. Postoperative quality was evaluated using photographs and plaster castings.

Results: Four patients were female and four were male. The age range was 7-35 years. The time to follow up was 2-29 months. Two patients had polyethylene implants. One was removed due to infection while the other was removed for unsatisfactory aesthetic results. Of the six cartilage frameworks, one was removed due to infection with extruding wire while the other five were removed due to unsatisfactory results. Postoperatively, there were no infections. One ear developed partial necrosis of the original post auricular skin graft, requiring another procedure for closure. All eight ears have maintained good size, contour, and appearance.

Conclusions: Salvage procedures for prior failed surgery are typically arduous challenges. This article reviews eight successful cases of secondary ear reconstruction. With this growing number of cases, we demonstrate that secondary reconstruction, using the existing tissue envelope and newly sculpted autogenous costal cartilage, is achieving improvement.
**AUDITORY REHABILITATION WITH SOPHONO ALPHA 2TET™**

*Sung Huhn Kim¹, Jae Young Choi¹, Bo Gyung Kim¹, Ho Ki Lee²*

¹Department of Otorhinolaryngology, Yonsei University College of Medicine, Seoul, Republic of Korea, ²Soree ENT Clinic, Seoul, Republic of Korea

**Object:** Sophono Alpha 2 TET™ is a prosthesis for hearing rehabilitation via bone conduction. Skin problem can be avoided in this system because the device is attached to a magnet which is implanted to the skull and there is no anchoring percutaneous abutment. We'd like to investigate the outcome of hearing rehabilitation of the device.

**Patients and Methods:** Six patients who underwent the surgery for Sophono Alpha 2 TET™ were enrolled. Five of them had conductive hearing loss due to congenital aural atresia (4 cases) and chronic otitis media (1 case). One of them had unilateral profound sensorineural hearing loss. We analyzed the operation time, problem during the operation, complications, and hearing gain after the surgery.

**Results:** The mean operation time was 1 hour and there was no problem during the operation. All patients with conductive hearing loss showed postoperative hearing threshold less than 40dBHL. Hearing gain was remarkable in the mid frequency range and hearing threshold at 1kHz was 20dBHL. SNR in HINT test was improved postoperatively in 3 cases with congenital aural atresia and 1 case with chronic otitis media. There was no postoperative complication.

**Conclusion:** Sophono Alpha 2 TET™ can provide effective hearing rehabilitation in the patients with conductive hearing loss.
SEMI-IMPLANTABLE TRANSCUTANEOUS BONE CONDUCTION HEARING DEVICE FOR CONGENITAL ATRESIA

Ralf Siegert, Jan Kanderske, Ralph Magritz
Prosper-Hospital, Recklinghausen, Germany

We have developed a new partially implantable Bone Conduction Hearing Device without a percutaneous abutment. Now we have developed and evaluated a new, simplified implantation technique, which can be followed by an early fitting of the external on the day of surgery.

The surgical procedure can be performed under local anesthesia in a one-step procedure. The magnets are either implanted into shallow bone beds (the only method used 2006 - 2012) or up-side-down with a special Silastic cover (since 2013). They are fixed with 4 micro-screws and the incisions are closed with a running fast absorbable suture. An external base-plate of the device is used as a slight pressure bandage. The primary fitting of the hearing device can now be done on the day of surgery.

We have implanted more than 150 patients since 2006 with this device. The average hearing gain was 28.6 dB ± 8.8 dB HL. Strength of the magnetic force that the patients had chosen themselves measured 0.9 ± 0.4 N. Skin thickness over the implants measured sonographically was 3.9 ± 0.8 mm.

After having performed more than 150 implantations to the best of our knowledge it is the fastest and easiest implantation technique ever being described for any type of implantable hearing device.
SAVAGE OF A TRANSCUTANEOUS BONE CONDUCTION IMPLANT AFTER BONE TRANSDUCER EXPOSURE

Adriana Ramírez¹,², Gabriel Osorno¹,²
¹Universidad Nacional de Colombia, Bogotá, Colombia, ²Hospital Universitario Clínica San Rafael, Bogotá, Colombia

The use of bone anchored hearing devices is the standard of care for microtia patients with conductive or mixed hearing loss. Recently, new transcutaneous systems have been developed with the purpose of avoiding skin-related complications of the percutaneous devices, while preserving a consistent level of hearing assistance.

We present a case of a 21-yr-old patient with unilateral microtia, previously reconstructed with autogenous rib graft, complicated by exposure of the Bone Mass Transducer from a Bonebridge implant. We discuss the surgical treatment using a Temporoparietal fascia flap, and the results after follow-up of 1 year demonstrating the successful salvage of the Bonebridge device and the preservation of the reconstructed microtia. This is the first report in the literature on this complication of transcutaneous bone conduction implants.
CREATION AND MAINTENANCE OF THE EXTERNAL AUDITORY MEATUS

Yang-Sun Cho¹, Il Joon Moon¹, Gyu Cheol Han²
¹Dept. of Otorhinolaryngology Head and Neck Surgery School of Medicine, Sungkyunkwan University, Samsung Medical Center, Seoul, Republic of Korea, ²Department of Otolaryngology Head & Neck Surgery, Gachon University of College Medicine, Incheon, Republic of Korea

The most important surgical goals for congenital aural atresia (CAA) are rehabilitation of hearing by restoring the normal sound-conducting mechanism of the ear and creating a clean, well-epithelialized, patent external auditory canal (EAC).

Prevention of postoperative EAC stenosis is imperative to reduce the rate of revision surgery. Numerous techniques, including covering lateral part of EAC with periosteal flap, packing, use of one piece of split-thickness skin graft, and/or injection of steroids have been made to prevent postoperative EAC stenosis. However, results reported in the clinical literature for the prevention of postoperative EAC stenosis have not been satisfactory. The reported rate of canal stenosis after canaloplasty has varied from 14% to 31%.

We applied a long-term stent to the patients who underwent canaloplasty to provide a mechanical pressure on the newly made EAC. The stent was made of acrylic mold material and applied for at least 6 months. In our consecutive 174 patients, postoperative EAC stenosis was the most common postoperative complication, occurring in 12 (6.9%) cases with a mean time interval of 7.1 months. For patients who did not use ear molds or hearing aid during the postoperative follow-up period, the relative risk for the development of postoperative EAC stenosis was 5.1 (95% confidence interval, 1.4-18.4; P=0.02).

Our results demonstrate that long-term stent use has the potential to significantly reduce the occurrence of postoperative EAC stenosis after surgical correction of CAA.
THREE-STAGE SURGERY OF COMBINING AURICLE RECONSTRUCTION, MEATOPLASTY AND TYMPANOPLASTY FOR CONGENITAL MICROTIA-ATRESIA

Lichun Zhang¹, Jin Shan¹, Kay W. Chang², Tianyu Zhang¹
¹Department of Otorhinolaryngology, Shanghai Eye & ENT Hospital, Shanghai Medical College, Fudan University, Shanghai, China, ²Department of Otolaryngology, Lucile Packard Children’s Hospital, Stanford University, California, USA

Objective: To investigate the validity and feasibility of our consecutive three-stage surgical technique of combining auricle reconstruction with canal atresia reconstruction in patients with congenital microtia-atresia, and to assess their post-surgery results from both cosmetic and hearing aspects.

Materials and Methods: From Sep. 2007, to Jun. 2011, all patients with congenital microtia-atresia treated in our department were enrolled in this study.

The three-stage surgical technique is described as follows:

1- The first stage is rib cartilage graft harvest, framework fabrication, and implantation, as described by Brent.
2- The second stage combines transfer of the lobule with drill out of the external auditory canal (EAC) from the anterior approach.
3- The third stage is elevation of the newly reconstructed auricle.

Both the cosmetic and functional hearing results were recorded at follow-up.

Results: In this study, there were 74 patients with 79 ears who completed our combined three-stage surgical technique. Among these patients, 60 patients (81%), 62 ears, have acquired extremely satisfactory cosmetic result; 10 patients (13%), 13 ears, have acquired acceptable cosmetic results; while the remaining 4 patients (5%) have acquired an unsatisfactory cosmetic result.

Among the 79 ears, there were 69 ears with follow-up audiograms. An air-bone gap (ABG) improvement of 16.90±1.53 was achieved. The air-conduction hearing threshold improved 15.70±2.24. 48 ears (69.6%) achieved serviceable hearing after surgery, with ABG less than 30 dB.

Conclusions: In conclusion, combined three-stage surgical microtia and canal atresia reconstruction is a viable choice for patients with microtia-atresia.

Key words: microtia, canal atresia, auricle reconstruction, atresiaplasty, atresia reconstruction
Patients with congenital aural atresia present a variety of challenges for clinicians. We will present a systematic review of the hearing outcomes of atresiaplasty surgery demonstrating a 60-73% success rate, with hearing outcomes deteriorating over time. One major alternative to atresiaplasty that has been widely used is osseointegrated bone conduction implants, which do present increased challenges in children versus adults, and have undergone an evolution in surgical technique, indications, and expected complications. The literature on osseointegrated bone conduction implants will be reviewed in this presentation, and potential advantages of newer transcutaneous and fully implanted devices introduced.
A CARE PATHWAY FOR PATIENTS WITH MICROTIA AND ATRESIA IN THE UK, INTEGRATING HEARING ASPECTS WITH RECONSTRUCTION AND FOCUSING ON A MULTIDISCIPLINARY APPROACH DELIVERING HOLISTIC CARE

Ruth Henderson
NHS Lothian, Edinburgh, UK

Aural atresia is present in 80% of patients with congenital microtia. In bilateral atresia the need for intervention to provide auditory stimulation is well established. However in cases of unilateral atresia the evidence for the impact of the condition and the functional benefit of intervention for hearing loss, is less clear and there are currently no agreed guidelines in the UK.

To address these issues collaboration has taken place between interested professionals and stakeholders representing professional organisations including ENT-UK and the British Association of Paediatricians in Audiology (BAPA), and with contributions from Audiologists working in the field.

The result is an agreed care pathway for patients with microtia and atresia, outlining the current evidence base, with recommendations for audiological assessment and monitoring. Additionally the available intervention options are considered in detail, including bone conduction aids and implantable devices. It is recommended that outcome measures are collected to inform practice, and anticipated that this care pathway will evolve over time as new evidence becomes available.
OBJECTIVE: To introduce our integrated protocol for staged treatment of microtia-atresia patients which combined auricle reconstruction and hearing rehabilitation.

PARTICIPANTS: 306 patients with microtia-atresia whom underwent auricle reconstruction and hearing rehabilitation surgeries in Peking Union Medical College Hospital (PUMCH) from January 2008 to March 2014 participated in the study.

INTERVENTIONS: Unilateral Bone-anchored hearing aid (Baha) Softband was applied when the patient was 3-month-old. Aural reconstruction was operated on the patients at the age of 6 years. In the first stage, a skin expander was implanted. In the second stage, auricle framework sculpted by rib cartilage was settled. For patients who scored less than 6 points graded by Jahrsdoerfer grading scale, Baha was implanted within this stage. In the third stage, remnant ear was dissected and atresiaplasty was operated for patients with a Jahrsdoerfer score higher than 6.

MAIN OUTCOME AND MEASURES: Speech audiometry test and mean pure-tone threshold results were compared among patients unaided and after hearing rehabilitation. Scores from questionnaires were used to measure patients’ satisfaction and subjective health benefit.

RESULTS: Most patients were satisfied with the results of their reconstructed ear. All patients with Baha experienced a substantial hearing gain. Some patients with atresiaplasties had a short-term hearing improvement and then experienced canal stenosis. The questionnaires demonstrated a significant benefit from the intervention.

CONCLUSIONS: An algorithm for the treatment of patients with microtia-atresia has been developed in PUMCH. The staged treatment of functional and aesthetic rehabilitation of microtia-atresia with Baha and ear reconstruction leads to good and reliable long-term results.
FREQUENCY OF SPEECH AND LANGUAGE DISORDERS IN PATIENTS WITH MICROTIA

Rene Pierdant Lozano1, Claudia Gutierrez Gomez2
1Hospital General Dr. Manuel Gea Gonzalez, Distrito Federal, Mexico, 2Universidad Nacional Autonoma de Mexico, Distrito Federal, Mexico

Background: The use of language is a social act used to understand and transmit meaning. There are certain pathologies that disrupt this function, such as microtia. This pathology has been associated with hearing loss in 90%. The prevalence of language disorders reported by the American Academy of Pediatrics is 3%. In Mexico, the INEGI reported a 9% prevalence of language disorders.

Methods: Patients that have been diagnosed with microtia at Hospital "Dr. Manuel Gea González", Mexico city, evaluated by ENT, Plastic Surgery, Phoniatrics, Audiology, Pediatrics, and all of them were videotaped for a blind evaluation of language.

Results: From a total of 506 patients, only 210 are now active, and of all of them, only 125 patients completed the inclusion criteria, 40% are female and 60% are male, 16.8% with bilateral microtia and 83.2% sided, 61.5% have right auricular deformities and 38.5% left. A mean age of 11.9 years. 47.2% have a non syndromic deformity, and 52.8% have another associated disease. The audiologic deficit average is a hearing threshold of 72.6 dB. 67.2% of the patients didn't have any type of speech or language disorder.

Conclusions: The frequency of speech disorders in our active population is 32.8% (16.8 phonetic and 16% phonologic), which means that patients with microtia have a risk 3 times higher to develop speech and language disorders than the regular population. After the results obtained in our study, we found crucial to give an integral approach in the early years of life to patients with microtia to prevent language and speech disorders.
AUDITORY IMPLANTS WITH ATRESIA SURGERY

Alex Bennett, Ken Stewart, Tiarnan Magos
University of Edinburgh, Edinburgh, UK

In the United Kingdom there are approximately nine million people with hearing impairment. Management depends on the underlying cause of hearing impairment, the communication needs of the patient and their personal preference. Active middle ear implants are only commissioned in the United Kingdom under strict circumstances where no alternative treatment is available.

We are the first and only centre in the United Kingdom combining the Bonebridge semi-implantable bone conduction hearing device and Vibrant Soundbridge (VSB) device with auricular reconstruction surgery. We present our experience.

More research on the neurodevelopmental effect of congenital unilateral hearing loss is required. We believe a service should treat the patient as a whole - not just cosmesis. A portfolio of hearing solutions should be offered to patients. Our experience demonstrates many do not want nor need auditory implants.
CHONDROGENIC DIFFERENTIATION AND THREE DIMENSIONAL CHONDROGENESIS OF HUMAN ADIPOSE STROMAL CELLS INDUCED BY CONDITIONAL MEDIA OF ENGINEERED CARTILAGE

Hengyun Sun1,2, Yu Liu2,3, Wenjie Zhang2,3, Wei Liu2,3, Yilin Cao1,2, Guangdong Zhou2,3
1Plastic Surgery Hospital, Chinese Academy of Medical Sciences, Peking Union Medical College, Beijing, China, 2Department of Plastic and Reconstructive Surgery, Shanghai 9th People’s Hospital, Shanghai Jiao Tong University School of Medicine, Shanghai Key Laboratory of Tissue Engineering, Shanghai, China, 3National Tissue Engineering Center of China, Shanghai, China

Due to lack of optimal inductive protocols, how to efficiently improve chondrogenesis of adipose stromal cells (ASCs) is still a great challenge. Our previous studies demonstrated that the culture media of chondrocyte-scaffold constructs (conditional media) contained various soluble chondrogenic factors and were effective for directing chondrogenic differentiation of bone marrow stem cells. Nevertheless, it remains unclear whether the conditional media can induce ASCs towards chondrogenic differentiation, especially for three-dimensional (3D) cartilage formation.

In this study, it demonstrated that the conditional media from chondrocyte-scaffold constructs could promote ASCs to differentiate into chondrocyte-like cells, with similar expression of type II collagen to those induced by chondrogenic growth factors. Moreover, the expression level of chondrocyte-specific genes, such as SOX9, type II collagen, and COMP, was even higher in conditional medium group (CM) than that in optimized chondrogenic growth factor group (GF), indicating that the conditional media can serve as an effective inducer for chondrogenic differentiation of ASCs. Most importantly, the conditional media could also induce ASC-scaffold constructs to form 3D cartilage-like tissue with typical lacunae structures and positive expression of cartilage specific matrices, even higher contents of GAG and type II collagen were achieved in CM group compared to GF group.

The current study establishes a simple, but stable, efficient, and economical method for directing 3D cartilage formation of ASCs, a strategy that may be more closely applicable for repairing cartilage defects.
We have developed a non-biodegradable nanocomposite polymer scaffold incorporating and polyhedral oligomeric silsesquioxanes (POSS) nanocage into polycarbonate-based urea-urethane (PCU) (POSS-PCU). The nanocomposite material has already been used for clinical application as the World’s First Synthetic Trachea, lacrimal duct and lower limb by-pass graft proving to be non-toxic and suitable for patient use. Artificial implants can be used to reconstruct the ear including Medpor to prevent the need for cartilage harvesting and allow earlier surgery. However, infection and extrusion has limited the use of synthetic materials for auricular reconstruction. In this study, we have investigated the suitability of using POSS-PCU as an auricular material replacement.

The physical and chemical properties of POSS-PCU auricular implants have been characterised and found to be suitable for cell adhesion. The behaviour of human dermal fibroblast (HDF) cells on the biomaterial was investigated to determine the potential of POSS-PCU polymer to support tissue integration.

HDF cells showed good cell attachment, proliferation and collagen production over 21 days on POSS-PCU auricular material. The biocompatibility of POSS-PCU was then evaluated by subcutaneously implantation of the scaffold in vivo followed by histology and immunocytochemistry. POSS-PCU showed good tissue integration and vessel formation over 3 months, demonstrating good in vivo biocompatibility.

Based on these preliminary studies, POSS-PCU proves to be a promising material for an auricular reconstruction. Further in vivo testing is being carried out before embarking on a clinical trial.
A COMBINED TISSUE ENGINEERING AND MATHEMATICAL MODELLING APPROACH TO INCREASE ACCURACY OF CRANIOFACIAL BONE RECONSTRUCTION IN HEMIFACIAL MICROsomia

Amel Ibrahim1,2, Mike Suttie1, Neil Bulstrode1,2, Jonathan Britto1,2, Alexander Seifalian3, Peter Hammond1, Patrizia Ferretti1
1University College London Institute of Child Health, London, UK, 2Great Ormond Street Hospital for Children, London, UK, 3UCL Centre for Nanotechnology & Regenerative Medicine, London, UK

Background: Hemifacial Microsomia (HM) is the second most common cause of congenital craniofacial abnormalities. There is a spectrum of anomalies including microtia, midface and mandibular hypoplasia which may require invasive surgery such as bone grafts, flaps and distraction osteogenesis to correct.

Human adipose-derived stem cells (hADSCs) possess multi-lineage differentiation potential and can be derived using minimally invasive surgery. They have the potential to provide a permanent autologous bone implant when combined with a suitable scaffold.

Computer-aided planning can be used to design and prefabricate implants required for accurate reconstruction.

Experimental Design: POSS-PCL and fibrin glue were tested as biodegradable scaffolds and compared for osteogenic, angiogenic and structural properties. Scaffolds were seeded with hADSCs and cultured in osteogenic media for 3 weeks. Chick chorioallantoic membrane (CAM) grafting was employed to assess biocompatibility and vascularisation.

Facial CT scans of control and affected children were used to build a 3-D Dense Surface Model (DSM).

Results: hADSCs were driven to osteogenic differentiation (verified by histochemical and molecular techniques) on POSS-PCL and fibrin glue. Angiogenesis was observed in CAM-grafts. Each experiment was repeated three times using different cell lines.

A DSM of the face was built with which HM patients can be compared against matched controls to plan accurate reconstruction.

Conclusions: Osteogenic differentiation is achieved on bioabsorbable scaffolds using osteogenic media and hADSCs. An anatomical model of the face is achievable from age-sex-matched control CT data. These technologies provide for a bio-integrated bespoke reconstructive alternative in the management of craniofacial defects in HM.
A NEW METHOD FOR CREATING STEREOLITHOGRAPHY MODELS IN AURICULAR RECONSTRUCTION USING OSIRIX®

Guillaume Carles
Causse Ear Clinic, Béziers, France

Introduction: Stereolithography is a computer assisted technology allowing creation of a 3D resin model, routinely used in maxillo-facial surgery. The author describes an easy, cost effective technique of carving pre-operative 3D resin template for auricular reconstruction using Osirix®.

Materials and methods: Eight patients who were operated for auricular reconstruction between 2012 and 2014, had pre-operative 3D modelisation by stereolithography. Six patients presented with unilateral microtia, one patient with bilateral microtia and one patient with a traumatic auricular defect.

In case of unilateral reconstruction (7 cases), a pre-operative 3D modelisation of the opposite ear was made by stereolithography. In case of bilateral reconstruction (1 case), a template was made from a normal ear of another patient and was used for both sides.

In all cases a CT scan of the normal ear was performed and a 3D stereolithography file was exported using Osirix®, a free available software. A stereolithography model of the mirror image of the 3D file was created.

The author was practising 3D framework sculpting before surgery. The model was sterilized by autoclaving. It was used during the first stage of auricular reconstruction to carve the cartilage framework. During the second stage it was used to determine the optimal position of the ear.

Conclusion: Stereolithography using Osirix® in auricular reconstruction is an easy and cost effective process of 3D modelisation. It replaces the usual 2D radio film template. This process helps surgeons to create the cartilage framework and is used during the first and second stages of ear reconstruction.
The advent of three-dimensional stereo-photogrammetry in recent years has vastly helped the craniomaxillofacial field improve in terms of preoperative and intraoperative decision-making.

The 3dMD system is applied to our auricular reconstruction. Validation of the measurement was completed first and technical points for intra-operative adjuvent fabrication then developed. A total of 20 normal adult ears were included in this study. Thirteen anthropometric measurements were taken, twice by two plastic surgeons using Direct Measurement (DM) and through images captured via 3dMD™.

The purpose was to compare the reliability of measurements involving the two instruments. The precisions of all ear anthropometries across observers were high in both methods, but the precision of 3dMD was better than DM irrespective of observers.

In addition, the Mean Absolute Differences (MAD) were less than a millimeter across all measurements. The application of three-dimensional technology in microtia surgery for both template production and soft tissue analysis leads to improved planning and satisfactory results.

With further refinement and enhancement, the use of this innovation will pave the way for prefabricated, individualized autologous or biocompatible alloplastic implantable frameworks based on an accurate mirror image of each patient's normal ear in unilateral cases and in bilateral cases, appropriately sized.
WHAT IS NEW IN THE TREATMENT OF CONSTRICED EARS?

Alexandre Marchac, Joseph Dusseldorp, Francoise Firmin
Clinique Bizet, Paris, France

Introduction: In 1975, Tanzer united cup and lop ear in a single entity coined constricted ear, where the rim of the ear has been tightened, as if by a purse string. Classified into four groups (I, IIA, IIB, III), a variety of techniques have been described for each sub-group. Our aim was to simplify this classification and introduce a safe and effective method for the treatment of constricted ears.

Material and methods: Between 2000 and 2013, the senior author (FF) operated 162 constricted ears. Charts were retrospectively reviewed for complications and outcomes were analyzed using a 4-point Likert type scale.

Results: Tanzer type I (n=32) were treated by direct helical rim remodelling. Tanzer type IIA (n=41) were treated by radial incisions stented by a conchal graft. Tanzer type IIB an III (n=89) were treated by single stage costal cartilage reconstruction. Complications included minor revisions (n=9), relapse (n=1), hypertrophic scaring (n=1), hematoma (n=1). Morphologic outcomes: very good (n=18), good (n=132), average (n=10), poor (n=2).

Conclusion: Constricted ears can actually be divided into three categories (mild, moderate, severe). Direct helical rim remodelling best treats mild constricted ears; moderate constricted ears are treated by a radial incision technique with conchal graft, and severe constricted ears by single stage costal cartilage reconstruction.
T-BAR RECONSTRUCTION OF CONSTRIC TED EARS AND A NEW CLASSIFICATION

Moshe Kon, Marieke van Wijk, Corstiaan Breugem
Dutch Center for Ear Reconstruction, Department of Plastic & Reconstructive Surgery, University Medical Center Utrecht, Utrecht, The Netherlands

For the correction of constricted ears, many techniques are described in the literature, the majority based on Tanzer's classification of 1975.

A new classification is presented, together with an alternative technique for the correction of group IIA and IIB deformities, using a T-strut of costal cartilage to reconstruct the underdeveloped or missing superior crus of the antihelix.
SURGICAL CORRECTION OF CONSTRICTED EAR COMBINED WITH STAHL’S EAR

Bi Ye, Jiang Haiyue, Lin Lin, Yang Qinghua, Pan Bo, Zhao Yanyong, He Leren
Plastic Surgery Hospital, Chinese Academy of Medical Sciences, Peking Union Medical College, Beijing, China

Objective: Constricted ear combined with Stahl’s ear is a very rare ear deformity. The surgical treatment was performed to correct this kind of congenital complex auricular deformity.

Method: From 1 January 2007 to 1 January 2014, 19 patients with constricted ear combined with Stahl’s ear were enrolled in this study. The deformity has the character of constricted ear and Stahl’s ear (spock ear) simultaneously. Most cases were unilateral deformity. To correct the deformity, a modified Z-shape or double Z-shape skin incision was designed on the posterior side of the auricle, the entire layer of cartilage was cut parallel to the helix to the third crus and a fan-shaped cartilage flap was formed. The superior crura of antihelix was shaped by the folding cartilage rim. The abnormal third crus was eliminated after resection of the cartilage and fibrous tissue.

Results: In all cases, the fundamental auricular structure was corrected, and the normal shape of the ear was restored. The third crus completely disappeared, the constricted helix was stretched, and cranioauricular angle decreased. Followed up between 8 to 87 months, all the patients and their parents were satisfied with the postoperative looking. No complication was observed.

Conclusions: This deformity could be corrected by appropriate surgical treatment, with a satisfied postoperative looking.
SURGICAL CORRECTION OF CRYPTOTIA: COMPARISON BETWEEN Z PLASTY AND TREFOIL FLAP

Jeong-Hoon Oh¹, Sang Won Yeo¹, Min-Hyun Park², Kyung Jin Roh¹
¹Department of Otolaryngology-Head and Neck Surgery, The Catholic University of Korea, Seoul, Republic of Korea, ²Department of Otorhinolaryngology-Head and Neck Surgery, SMG-SNU, Boramae Medical Center, Seoul, Republic of Korea, ³Department of Otorhinolaryngology, Gangnam Severance Hospital, Yonsei University, College of Medicine, Seoul, Republic of Korea

One of the main characteristics in the anatomical deformities in cryptotia is the invagination of the superior half of the auricle under the overlying temporal skin. Secondary abnormalities that often coexist with cryptotia include cartilage deformation, an underdeveloped scapha, and a sharply curved antihelical crus. Various operative techniques have been described, including V-Y plasty, Z plasty, local skin flaps, and various combinations of flaps and skin grafts. Here the author presents cases of cryptotia that were treated using Z plasty or Trefoil flap, and compare the results of these operative techniques.
THE PROMINENT EAR; CLASSIFICATION AND AN ALGORITHMIC APPROACH FOR PROPER TREATMENT.

Kim Young Soo¹, Yoon In Sik²
¹Bona Microtia and Aesthetic Ear Surgery Clinic, Seoul, Republic of Korea, ²Department of Plastic and Reconstructive Surgery, Yonsei University, College of Medicine, Seoul, Republic of Korea

The main causes of prominent ear include an inadequate formation of the antihelical fold, the conchal hypertrophy and combination of both. In addition to these main causes, the author have frequently observed some minor anatomical deformities, such as absence or retrusion of the inferior crus, helix-scapha hypertrophy in the prominent ear patients. If these minor deformities would be overlooked, uncorrected these components could contribute to reduce the satisfaction of the results.

From January 2009 to January 2014, 167 prominent ears underwent the otoplasty. Bilateral patients were 64 and unilateral were 39 cases. Ages ranged from 7 to 45 year-old (< 10 yr.: 2, 10-20 yr.: 7, >20 yr.: 94).

According to the anatomical deformities of the prominent ear, the author classified the prominent ears into five types: type I is an ear with antihelical unfolding only, Type II is an ear with antihelical unfolding and underdevelopment (absence or retrusion) of the inferior crus, Type III is an ear with antihelical unfolding and conchal hypertrophy, Type IV is an ear with antihelical unfolding and scapha-helix hypertrophy, and type V is an ear with combination of more than two other deformities.

The author also propose a surgical algorithm based on our classification for the better results in correction of the prominent ears in this presentation.
A lack of finesse in surgery to set back prominent ears can cause major dissatisfaction. Twenty cases which were settled through the courts are reviewed, with post-operative complaints ranging from buckled cartilage to total ear loss. Awards made by the courts ranged from £13,000 and £38,000.

The problems encountered and the surgical errors made are reviewed, and safer techniques outlined.

The over set-back ear is a frequent complaint after enthusiastic surgery for prominent ears and increasingly after extensive conchal cartilage harvesting for nasal reconstruction. Patients’ ideas of the perfect result vary widely and many problems can be saved simply by sitting a patient in front of a mirror to discuss their perception of the ideal ear position prior to surgery.

While sutures can pull tissues together, grafts are required to push tissues apart. Fifteen cases are reviewed in which costal cartilage blocks were inserted to increase ear projection. All patients also required V-Y advancement for skin shortage. Techniques for correction using conchal cartilage grafts were less effective.
Introduction: Prominent ear correction in children is a popular procedure, with demonstrable benefit in alleviating psychological distress. Posterior cartilage-sparing techniques for otoplasty have been shown to be consistently superior to cartilage-scoring alternatives, however excision of the posterior auricular skin during otoplasty, although a common first step, has not been shown to have any benefits over skin incision alone. In this study, we examined the association between skin excision and recurrence of ear prominence, by examining the surgical outcomes of five plastic surgeons, operating at the Royal Hospital for Sick Children in Edinburgh.

Patients and Methods: The collective outcomes of five plastic surgeons between January 2011 and December 2013 were included in the study. Three of the surgeons perform high numbers of otoplasties annually, while two are low volume operators. Clinical recurrence of prominence was cross-tabulated against postauricular skin excision and tested for significance. Statistical differences in surgical outcomes between high and low volume operators were also examined.

Results: One hundred eighteen procedures were identified. Recurrence of prominence at first follow-up appointment (mean 3.4 months) was 10.2%. Surgeons with low case volumes had significantly higher recurrence rates than high volume operators ($p<0.001$). There was no statistically significant association between skin excision and recurrence of prominence.

Conclusions: We still favour posterior, cartilage-sparing otoplasties, but based on our findings we do not advocate any skin excision at any stage of the procedure. Furthermore, surgeons should not include paediatric otoplasty in their portfolio unless they are undertaking significant number of cases each year.
THE FOLD-OVER HELICAL RIM REVISITED

David Gault
Ear Aesthetics and Reconstruction, London, UK

A technique to correct the folded-over helical rim, whereby the abnormal cartilage was repositioned within the skin envelope, has been used as standard for over 10 years.

Some fold-over rims are resistant to this technique however, and a better correction is achieved from the outset by carving a new helical rim from a floating rib. A guide to the use of both techniques is presented.

RECONSTRUCTION OF PARTIAL DEFORMITY OF THE EAR IN ACQUIRED AND CONGENITAL CASES

Greg O'Toole
Royal Free Hospital, London, UK

Reconstruction of part of the ear requires adherence to similar principles to those applied to total defects. A robust framework of autogenous cartilage and well vascularised and thin soft tissue cover remains the gold standard.

In this presentation, the common errors in traumatic amputation - attempting to re-graft an amputated ear, banking auricular cartilage, unnecessary sacrifice of the temporo-parietal flap and the use of prosthetic materials will be highlighted.

Cases of congenital deformity requiring partial reconstruction, and the specific problems they present to the ear reconstruction surgeon, will also be considered.

Some of the more debatable controversies will also be discussed in this presentation, the results of over 60 cases presented, and illustrative examples shown.
PARTIAL AURICULAR RECONSTRUCTION USING LOCAL FLAPS AND CHONDROCUTANEOUS FLAP

Satoshi Urushidate, Makoto Mikami, Yuko Higuma, Makiko Saito, Katsunori Yokoi, Takatoshi Yotsuyanagi

1Department of Plastic and Reconstructive Surgery, Hirosaki University Graduate School of Medicine, Hirosaki, Aomori, Japan, 2Department of Plastic and Reconstructive Surgery, Sapporo Medical University School of Medicine, Sapporo, Hokkaido, Japan

Purpose: The auricle is one of the regions where skin cancer occurs frequently, and mostly reconstruction is required after the excision. The reconstructed auricle should have natural three-dimensional structure and enough strength against the scar contracture. The local flap and chondrocutaneous flap are useful because they bring a good aesthetic outcome. We present our strategy for partial reconstruction of the auricle in this report.

Methods: We decide reconstruction method according to size and location of the defect. The defect of concha and lobule are reconstructed with retroauricular flap. The concha is usually reconstructed with skin flap only, but lobule is reconstructed using chondrocutaneous flap so that it can maintain the lobule form.

The small defect of helix is sutured directly. The defect smaller than one third of helix is reconstructed with chondrocutaneous flap from concha. After that the defect of concha is covered with retroauricular flap. If the defect is larger than one third of helix, it is difficult to reconstruct with local flaps. Therefore we have to consider cartilage grafting which covered with temporoparietal fascial flap and skin grafting or with local flaps.

Results: Flaps survived without major complications and good aesthetic outcomes were obtained with our method.

Conclusion: The retroauricular flap and the chondrocutaneous flap from concha are very useful for reconstructing the auricle, because they have safe blood supply and good color and texture match. When we reconstruct the auricle it is also important that reconstructed auricle has enough size and bilateral symmetry.
EAR RECONSTRUCTION FOLLOWING PUNITIVE EAR AMPUTATIONS IN UGANDA

Andrew Hodges, Joseph Dusseldorp, Alexandre Marchac, Francoise Firmin
CoRSU Rehabilitation Hospital, Kampala, Uganda

This paper will describe the activity of two surgical visits to CoRSU Rehabilitation Hospital by Dr Firmin and Dr Marchac to perform and teach ear reconstruction on a cohort of adult women who all underwent punitive amputations of the ear. It will describe the background to the conflict and the reasons for amputation, the surgical setting and the social setting of the environment from which the patients come. We will also outline the surgical challenge and the modifications made to suit the particular environment. We will discuss surgical outcomes and patient satisfaction and finally discuss the wider aspect of such surgical missions with a global perspective.
CLINICAL CONSIDERATIONS REGARDING AURICULAR RECONSTRUCTION IN TREACHER COLLINS-FRANCESCHETTI SYNDROME: A PERSONAL SERIES OF 75 PATIENTS

JR Dusseldorp, A. Marchac, F. Firmin
Clinique George Bizet, Paris, France

Background: The patient born with Treacher Collins-Franceschetti Syndrome has unique maxillofacial concerns and a treatment paradigm that is usually highly individualized. Results of auricular reconstruction are frequently disappointing due in part to anatomical features of the auricular region in this condition including thickness of the local skin, weak and insufficiently vascularized temporal fascia, deficient volume of the underlying mastoid bone. METHODS: Retrospective analysis of a personal series of 75 consecutive cases was performed.

Results: Bilaterality, lobular type and a correlation between the extent of upper third dysmorphology and severity of auricular dysplasia were discovered. The superficial temporal artery was also found to be ectopic in almost half of the cases. Patients were likely to desire auricular reconstruction as their first procedure. Though possible to achieve excellent results cases have been on average less successful due to low positioning of the ears and a lack of definition of the auricular features.

Conclusions: We will demonstrate our approach and outline the challenges faced in combining facial, bi-maxillary and auricular reconstruction in this difficult patient group.
DETAILED STRATEGIES OF EAR RECONSTRUCTION WITH BADACHU METHOD FOR THE MICROTIA PATIENTS ACCOMPANIED WITH HEMIFACIAL MICROSOMA

Leren He¹, Jinguang Zhang², Haiyue Jiang¹, Hongxing Zhuang¹, Qinghua Yang¹
¹Plastic Surgery Hospital, Chinese Academy of Medical Sciences, Peking Union Medical College, Beijing, China, ²the Luhe Teaching Hospital of Capital Medical University, Beijing, China

Objective: To explore the strategies of ear reconstruction with Badachu Method for the microtia patients accompanied with hemifacial microsoma.

Method: In recent 10 years, we performed ear reconstruction surgeries with Badachu method for 1300 II+ hemifacial microsoma patients. In all cases, we paid special attention to the following three questions: 1, location: earlobe plus axis positioning method. 2, framework: the special style framework. 3, the utilization of remnant ear.

Results: The results of 28 cases couldn’t be evaluated because of the delayed healing. In other 1272 cases, the new ears achieved the desired index one month after the surgeries. 200 cases were followed up from 1 year to 9 years. The results of 110 cases were excellent. The results of 65 cases were good. The results of 23 cases were not good. In 2 cases, their reconstructed ears were partly or entirely absent because of other causes. The ratio of excellent and good cases to all following up patients was 87.5%.

Conclusion: It is difficult to make the reconstructed ear symmetric to the contralateral one in the microtia patients accompanied with II+ hemifacial microsoma. The key included the location of new ear, the fabrication of framework and the utilization of remnant ear. Earlobe plus axis positioning method made the new ear similar to its counterpart in the vertical axis; Special style framework fabrication made the new ears’ height and position relatively stabilized and utilization of remnant ear according to their roles made the crus, tragus, and earlobe, etc., more natural.
A very practical and inconspicuous dressing made of cast and surgical tape is shown. This very simple method allows for comfort and disguise, while it provides a powerful shaping of the newly reconstructed contours of the ear.
EAR PARALLAX: THE IMPORTANCE OF CORRECT EAR POSITIONING IN AURICULAR RECONSTRUCTION

David Sainsbury1,2, April Clausen1, Leila Kasrai3,4, David Fisher1,4
1Hospital for Sick Children, Toronto, Ontario, Canada, 2Royal Victoria Infirmary, Newcastle-upon-Tyne, UK, 3St. Joseph’s Health Centre, Toronto, Ontario, Canada, 4University of Toronto, Toronto, Ontario, Canada

Introduction: Debate abounds regarding the significance of correct ear positioning prior to auricular reconstruction. We demonstrate the importance of parallax, causing apparent vertical height discrepancy in anteriorly malpositioned ears when compared to the normal contralateral ear, using trigonometry and digitally manipulated 3D photographs.

Methods: A 3D photograph was captured of a volunteer with a normal facial profile and ears. One ear was digitally removed and the contralateral ear transposed to identically mirror the original. The transposed ear was moved anteriorly in 5mm increments to a total of 30mm. At each of these 5mm increments neck flexion and extension was performed at 5° intervals up to 30°. The degree of apparent vertical height discrepancy was calculated using imaging software and traditional trigonometry.

Results: Using both the manipulated 3D images and trigonometry the vertical height discrepancy at 10°, 20° and 30° of neck flexion/extension at 10mm anterior displacement was 1.7mm, 3.4mm and 5.0mm, at 20mm anterior displacement 3.5mm, 6.8mm and 10.0mm, and at 30mm anterior displacement was 5.2mm, 10.3mm and 15.0mm, respectively.

Conclusions: This study demonstrates the importance of correct ear positioning in auricular reconstruction. Due to parallax, with increasing anterior ear malpositioning and with increasing neck flexion or extension the amount of apparent vertical height discrepancy increases in a linear fashion when compared to a contralateral normal ear. We believe this supports the philosophy that for a reconstructed ear to fulfil its purpose it must not only look like an ear, but must also be positioned like an ear.
EARFOLD - AN IMPLANTABLE DEVICE TO CORRECT EAR PROMINENCE

Greg O’Toole
Royal Free Hospital, London, UK

The “earfold” is a new device, wafer thin, made of an alloy of nickel and titanium and coated with 24 carat gold. It is inserted under the anterior skin in a minor procedure which takes a few minutes, immediately reshaping the ear and correcting its prominence.

The author will present a description of how the device is used, and the results of over 250 patients who have been treated. Early studies of the device allowed for certain modifications to be made to improve minor issues with its use and these will also be discussed.

Before and after results will be presented and the advantages and disadvantages debated.
AURICULAR CARTILAGE STIFFNESS MEASUREMENT BY DYNAMOMETER

Gyu Cheol Han¹, Mi Joo Kim², Yun-Hoon Choung³, Yang-Sun Cho⁴
¹Department of Otolaryngology-Head and Neck Surgery, Gachon University of Medicine and Science, Graduate School of Medicine, Incheon, Republic of Korea, ²Department of Otorhinolaryngology, International ST Mary’s Hospital, Incheon, Republic of Korea, ³Departments of Otolaryngology, Hematology-Oncology, Ajou University School of Medicine, Suwon, Republic of Korea, ⁴Department of Otorhinolaryngology-Head and Neck Surgery, Samsung Medical Center, Sungkyunkwan University School of Medicine, Seoul, Republic of Korea

Background and Objectives: In the auricular reconstruction or the deformity correction, cartilage stiffness exerts a great influence over the anesthetic outcome. Nevertheless, most otoplasty procedures have empirically overcome the cartilage elasticity. Ear cartilage has a complicated structure and a diverse range of morphological deformities. Furthermore, measurement regions, as well as the methods, can generate measurement errors as different regions have their own elasticities. A comprehension of the specified regional elasticity could be restrictedly useful for the surgical procedure and surgical material selections.

Materials and Methods: In this study, the above-mentioned force was measured three times per ear for 60 normal seated individuals (M/F=30/30, 5-83 year old) with no auricular deformity, and the mean force (N) values of individual ears were used. For measurement, a dynamometer (GD-25, Jonard Ind. Co., Tuckahoe, NY, USA) was used. The dynamometer was fixed to the anti-helix region, where it meets with the imaginary horizontal extension line from the EAC upper margin, and the force was measured when the subject feels the contact between the helical rim of the same extension line and the mastoid.

Results: There was a significant consequential increase in the mean force with increasing age (r=0.784, P<0.001) and the mean force measured on females was significantly lower, compared to that of males (M/F=0.098/0.156, p<0.01).

Conclusion: The cartilage stiffness measurements of the specified ear region with varying age and gender showed the biggest mean force for the advanced age males. This cartilage stiffness measurement method would be highly useful for quantification of otoplasty data.
<table>
<thead>
<tr>
<th>Author</th>
<th>Page(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ablaza Lizardo, Jesus</td>
<td>O-59</td>
</tr>
<tr>
<td>Albert, Asteria</td>
<td>O-5</td>
</tr>
<tr>
<td>Alonso, Nivaldo</td>
<td>O-8</td>
</tr>
<tr>
<td>Arkoulis, Nikolaos</td>
<td>O-66</td>
</tr>
<tr>
<td>Bennett, Alex</td>
<td>O-54</td>
</tr>
<tr>
<td>bhumkar, ashesh</td>
<td>O-10, O-56</td>
</tr>
<tr>
<td>Bo, Pan</td>
<td>O-62</td>
</tr>
<tr>
<td>Brakovsky, Yvonne</td>
<td>O-40</td>
</tr>
<tr>
<td>Breugem, Corstiaan</td>
<td>O-1, O-61</td>
</tr>
<tr>
<td>Britto, Jonathan</td>
<td>O-57</td>
</tr>
<tr>
<td>Bulstrode, Neil</td>
<td>Keynote10, O-2, O-39, O-57, O-6</td>
</tr>
<tr>
<td>Butler, Peter</td>
<td>O-56</td>
</tr>
<tr>
<td>Cao, Yilin</td>
<td>O-55</td>
</tr>
<tr>
<td>CARLES, Guillaume</td>
<td>O-58</td>
</tr>
<tr>
<td>CECCHI, PATRICIA</td>
<td>O-13</td>
</tr>
<tr>
<td>Chang, Kay W</td>
<td>Keynote8, O-49, O-50</td>
</tr>
<tr>
<td>Chan, Kai Chieh</td>
<td>O-43</td>
</tr>
<tr>
<td>Chen, Xiaowei</td>
<td>O-52</td>
</tr>
<tr>
<td>Chen, Ying An</td>
<td>O-59</td>
</tr>
<tr>
<td>Chen, Zung Chung</td>
<td>O-43, O-59</td>
</tr>
<tr>
<td>Choi, Jae Young</td>
<td>O-45</td>
</tr>
<tr>
<td>Choung, Yun-Hoon</td>
<td>P-4</td>
</tr>
<tr>
<td>Cho, Yang-Sun</td>
<td>O-48, P-4</td>
</tr>
<tr>
<td>Clapperton, K</td>
<td>O-20</td>
</tr>
<tr>
<td>Clapperton, Kerr</td>
<td>O-32</td>
</tr>
<tr>
<td>Clausen, April</td>
<td>P-2</td>
</tr>
<tr>
<td>Clavería, Maria Antonia</td>
<td>O-5</td>
</tr>
<tr>
<td>Correa, Jessica</td>
<td>O-5</td>
</tr>
<tr>
<td>Cugno, Sabrina</td>
<td>O-39</td>
</tr>
<tr>
<td>DUMON, Thibaud</td>
<td>Keynote9</td>
</tr>
<tr>
<td>Dusseldorp, Joseph</td>
<td>O-60, O-70</td>
</tr>
<tr>
<td>Dusseldorp, JR</td>
<td>O-72</td>
</tr>
<tr>
<td>El-Mutardi, Naguib</td>
<td>O-39</td>
</tr>
<tr>
<td>Fairbanks, Grant A</td>
<td>O-44, O-7</td>
</tr>
<tr>
<td>Fairbanks, Grant R</td>
<td>O-44, O-7</td>
</tr>
<tr>
<td>Fan, Yue</td>
<td>O-52</td>
</tr>
<tr>
<td>Farmer, Eleanor</td>
<td>O-6</td>
</tr>
<tr>
<td>Ferretti, Patrizia</td>
<td>Keynote10, O-57</td>
</tr>
<tr>
<td>Name</td>
<td>Number</td>
</tr>
<tr>
<td>--------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>Figueroa, Johnatan</td>
<td>O-34</td>
</tr>
<tr>
<td>Firmin, F</td>
<td>O-72</td>
</tr>
<tr>
<td>Firmin, Françoise</td>
<td>O-60, O-70</td>
</tr>
<tr>
<td>Fisher, David</td>
<td>O-18, P-2</td>
</tr>
<tr>
<td>Florin, Carla</td>
<td>O-28</td>
</tr>
<tr>
<td>Gault, David</td>
<td>O-2, O-23, O-36, O-65, O-67</td>
</tr>
<tr>
<td>Gonda, Ayako</td>
<td>O-4</td>
</tr>
<tr>
<td>Greensmith, Andrew</td>
<td>O-21</td>
</tr>
<tr>
<td>Griffin, Michelle</td>
<td>O-56</td>
</tr>
<tr>
<td>Guasti, Leonardo</td>
<td>Keynote10</td>
</tr>
<tr>
<td>Gutierrez, Claudia</td>
<td>O-34</td>
</tr>
<tr>
<td>GUTIERREZ-GOMEZ, CLAUDIA</td>
<td>O-22</td>
</tr>
<tr>
<td>Gutierrez Gomez, Claudia</td>
<td>O-53</td>
</tr>
<tr>
<td>Haiyue, Jiang</td>
<td>O-62</td>
</tr>
<tr>
<td>Hammond, Peter</td>
<td>O-57</td>
</tr>
<tr>
<td>Han, Gyu Cheol</td>
<td>O-48, P-4</td>
</tr>
<tr>
<td>Han, Juan</td>
<td>O-16</td>
</tr>
<tr>
<td>He, Leren</td>
<td>O-38, O-76</td>
</tr>
<tr>
<td>Henderson, Ruth</td>
<td>O-51</td>
</tr>
<tr>
<td>Higuma, Yuko</td>
<td>O-69</td>
</tr>
<tr>
<td>Hodges, Andrew</td>
<td>O-70</td>
</tr>
<tr>
<td>Ibrahim, Amel</td>
<td>O-57</td>
</tr>
<tr>
<td>In Sik, Yoon</td>
<td>O-15, O-64</td>
</tr>
<tr>
<td>Jahns, Francesca</td>
<td>O-42</td>
</tr>
<tr>
<td>Jiang, Haiyue</td>
<td>O-16, O-38, O-76</td>
</tr>
<tr>
<td>Kai, Wang</td>
<td>O-29</td>
</tr>
<tr>
<td>Kalaskar, Deepak</td>
<td>O-56</td>
</tr>
<tr>
<td>Kanderske, Jan</td>
<td>O-46</td>
</tr>
<tr>
<td>Kasraei, Leila</td>
<td>O-18, P-2</td>
</tr>
<tr>
<td>Khan, Aisha</td>
<td>O-5</td>
</tr>
<tr>
<td>Kim, Bo Gyung</td>
<td>O-45</td>
</tr>
<tr>
<td>Kim, Mi Joo</td>
<td>P-4</td>
</tr>
<tr>
<td>Kim, Sung Huhn</td>
<td>O-45</td>
</tr>
<tr>
<td>Kitada, Ayaka</td>
<td>O-17</td>
</tr>
<tr>
<td>Kolodzinskyy, Mischka</td>
<td>O-1</td>
</tr>
<tr>
<td>KOn, Moshe</td>
<td>O-1, O-61</td>
</tr>
<tr>
<td>LAUDA, LORENZO</td>
<td>O-14</td>
</tr>
<tr>
<td>Lee, Ho Ki</td>
<td>O-45</td>
</tr>
<tr>
<td>Leren, He</td>
<td>O-62</td>
</tr>
</tbody>
</table>
LI, DaTao O-27
Lin, Lin O-16, O-38, O-62
Liu, Wei O-55
Liu, Yu O-55
Li, Yiyuan O-27
Magos, Tiarnan O-54
Magritz, Ralph Keynote 4, O-46
Majdak-Paredes, EJ O-20
Manzanares, Alejandro O-5
Marchac, A O-72
Marchac, Alexandre O-60, O-70
McDonald, Suzanne O-32
MEDINA, Marimar Keynote 9
Mennie, J O-20
Mennie, Joanna O-32
Mikami, Makoto O-69
Moffat, Catriona O-32
Moon, Il Joon O-48
Moroi, Kunitake O-17
Morovic, Carmen O-28
Murphy, George O-2
Nagata, Satoru Keynote 7
Nayef Albdour, Mohammad Nayef Albdour, MD O-59
Nayyer, Leila O-56
New, Sophie Keynote 10
Öberg, Martin O-35
O'Hara, Justine O-6
Oh, Jeong-Hoon O-63
O’ Neill, Conor O-66
ORTIZ MONASTERIO T, FERNANDO O-22
Osorno, Gabriel Keynote 3, O-47
O'Toole, Greg O-2, O-68, P-3
Pan, Bo O-16
Park, Chul Keynote 1, Keynote 11, O-26
Park, Min-Hyun O-63
Parri, Francisco O-5
PEREZ-DOSAL, MARCIA O-22
Perry, Fiona O-6
Pierdant Lozano, Rene O-53
Qinghua, Yang O-62
Ramirez, Adriana O-9
Ramírez, Adriana O-47
RAMIREZ, NURIA O-22
Rautio, Jorma O-37
Reid, Jenny O-66
Reinisch, John Keynote 5, O-42
Roh, Kyung Jin O-63
Roos, Emma O-35
Rope, Ali O-42
RUIZ, ELOISE O-22
RUSSO, ALESSANDRA O-14
Sabbagh, Walid O-2, O-25
Sainsbury, David P-2
Saito, Makiko O-69
Saito, Tamotsu O-17
SANCHEZ, GUILLERMO O-22
Seifalian, Alexander Keynote10, O-56, O-57
Shan, Jin O-49
Siegert, Ralf Keynote 4, O-46
Steele, Jessica O-6
Stewart, Ken O-3, O-32, O-54, O-66
Stewart, KJ O-20
Sugai, Asuka O-4
Sun, Hengyun O-55
Sutte, Mike O-57
Telang, Parag O-11, O-24
Tonello, Cristiano O-8
Urushidate, Satoshi O-69
Vagaska, Barbora Keynote10
Valotta, Maria Fernanda O-12, O-41, P-1
van den Boogaard, Marie-Jose O-1
van Nunen, Daan O-1
van Wijk, Marieke O-61
Wang, Yibei O-52
Wang, Yongzhen O-38
Wang, Zhen O-52
Weerda, Hilko Keynote 4
Wikström, SO O-35
Wilkes, Gordon  
Woollard, Alex  
Xu, Feng  
Xu, ZhiCheng  
Yamashita, Ken  
Yamauchi, Makoto  
Yang, Qinghua  
Yanyong, Zhao  
Ye, Bi  
Yeh, Hsuan Keng  
Yeo, Sang Won  
Yokoi, Katsunori  
Yoshida, Mauricio  
Yotsuyanagi, Takatoshi  
Young Soo, Kim  
Zepeda, Javier  
Zhang, Jinguang  
Zhang, Lichun  
Zhang, Qingguo  
Zhang, Qun  
Zhang, Ruhong  
Zhang, Tianyu  
Zhang, Wenjie  
Zhao, Yanyong  
Zhou, Guangdong  
Zhuang, Hongxing  
Zuo, Kevin