VSB, mixed hearing loss, conductive hearing loss, middle ear implant, vibroplasty and combinations of them. Data were only extracted if reported in the text or tables, or if they could be accurately calculated from graphs, figures, or raw data sets. Information was extracted from each article on 1) sample characteristics (age, gender, aetiology, diagnosis, treatment received/receiving), 2) type of intervention (use of HA, surgical approach, audio processor type), and 3) type of outcome measures (testing intervals, surgical complications, AC and BC pure tone thresholds, sound-field thresholds, functional gain, hearing preservation, speech perception/recognition at various presentation levels in quiet and noise, results of questionnaires). The evidence presented in the selected studies was assessed and classified using the levels of evidence defined by the Oxford Centre for Evidence-based Medicine.

As demonstrated by the variety of studies reported, the VSB and the specific surgical techniques developed ("vibroplasty") have enabled to adapt this active, electronic middle ear implant to nearly every pathophysiological situation within the middle ear and to restore hearing by amplification of residual hearing. This new strategy in hearing rehabilitation has lead to an improved quality of hearing and life of the patients, respectively.

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Free Papers (F662)

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Prognostic Factors in Paediatric Cochlear Implantation: Definition Location Evaluation

Presenting Author: **Jane Black**

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Learning Objectives:

Objectives: Accurate prognostication in paediatric cochlear implantation (PCI) is essential for informed counselling of a child's outlook during the pre-operative period. This work sought to devise a methodology by which researchers could more clearly define, locate and evaluate adverse factors in PCI to formulate an accurate prognosis to counsel the family prior to implantation, the key to success in PCI.

Method: Three steps in the prognostic process are addressed 1) the exact site, action, probability and severity of the individual adverse factors are assessed using refined descriptors to more clearly denote the pathology and action of these influences 2) illustration of the anatomical location of the factors along the route of PCI stimulation, location of the pattern of influences and their potential impact on the functional aspects of the auditory pathway 3) an evaluation method is presented that allows location of individual factors, their impact on ability, then an estimation of their cumulative effect, the prognosis. Six domains of ability are assessed: cortical maturation, neurological function, otological, general medical, psychological and family.

Result: Considerable difficulties and deficiencies of prior prognostic works are demonstrated. The work provides a "road map" by which clinicians may assemble an orderly estimation of the threats present in a particular case. The evaluation technique, yet to be validated by clinical research, offers a sensibility method of prognostic assessment in PCI.

Conclusions: PCI prognostication requires precise evaluation of the site, pathology and action of adverse factors with focus on the specific pathology, systematic examination of the auditory pathway and a method of evaluation of the combined effect of several impaired domains. However, the overall impact remains an individual study, case-by-case due to the complexity of each situa, particularly in the complicated management of the child with multiple difficulties.

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Free Papers (F662)

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Keyhole cochlear implantation surgery: adaptation to Soundbridge and Bonebridge devices

Presenting Author: **Bruce Black**

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Introduction: Cochlear implantation (CI) techniques have evolved towards progressively minimalist surgery. Three guiding principles have emerged. Firstly, brief, limited surgery, to minimise the overall impact, particularly in small infants. Secondly, safety issues: good outcomes with minimal complications. Thirdly, acceptable psychological/cosmetic results, especially with repect to the families of children.

Hitherto, similar surgical principles for the implantation of other devices has attracted only limited comment.

Materials and Methods: Keyhole CI sugery, as outlined in previous work, has achieved the above outcomes effectively. A later modification stabilises the device in situ using a soluble percutaneious suture passed around the neck of the device, when in the pericranial pocket, replacing previous stabilisation methods. Bony retention wells are avoided.

The Keyhole method has been adapted to the Med EL Soundbridge and Bonebridge devices. The former requires a larger posterior tympanotomy to permit fixation to the incus, and this may be supplemented by a transcanal approach.

The Bonebridge surgery employes a slightly larger auricular incision and a loose pericranial pocket, as fixation is not problematic. The larger pocket facilitates implant positioning over the fixation points.

Results: In over 600 CI cases, plus 36 Soundbridge and 25 Bonebridge cases the keyhole approach has achieved optimal outcomes in terms of the three principles above, being brief, with minimal trauma and scarring.

Conclusions: The Keyhole implant method is optimal for all three devices, with particular advantages for bilateral simultaneous CI in the small infant.

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Free Papers (F662)

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Surgical outcomes in BAHA Surgery as a function of incision / soft tissue / implant type

Presenting Author: **Ahmed Allam**

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Learning Objectives:

Objectives: To determine the relationship between surgical outcomes and incision, soft tissue technique and implant types.

Method: A retrospective study of paediatric / adult patients receiving Cochlear® BAHA (April 2010 -March 2013). Age 6–89 years. The outcome compared for a single surgeon. Patients were divided into 3 groups according to technique:

Group 1: Inferiorly based scalp flap raised by dermatome for Cochlear® BI300 abutments (n = 20). **Group 2**: Sheffield incision (short 'lazy S' within hairline, soft tissue reduction) for Cochlear® BI300 abutments (n = 35). **Group 3**: Short linear incision, non-soft tissue reduction technique for the Cochlear® BI400 hydroxyapatite coated abutments (n = 35) **Group 4**: BAHA Attract (inferiorly based "C" shaped flap). (n = 20).

Results: **Group 1:** Bald patch with wide numbness in all. Soft tissue complications: overall 14%, flap related problem (14% flap breakdown, 13% granulations) and 8% fixture los. Surgical time 1.5 hours. **Group 2:** Aesthetically pleasing. No bald patch. Divot formation. Significant numbness. No major complications like flap necrosis or fixture loss. One patient had a wound haematoma and dehiscence which needed closure. Minor granulations (13%), skin redness (9%) (Holgers 2), small wound dehiscence (3%). All settled conservatively. Surgical time 45 min. **Group 3:** Aesthetically pleasing. No bald patch. No divot. No granulations. Smaller area of numbness. Wound breakdown in one (abutment placed in incision line) needing secondary suture. Surgical time 25 min. **Group 4:** Aesthetically pleasing. No bald patch. No divot. No granulations. Larger area of numbness. No wound breakdown. Maintenance free. Surgical time 40 min.

Conclusions: The introduction of newer abutments as well as transcutaneous techniques with minimal soft tissue mobilisation / handling has reduced surgical time, post operative care, complications and patient morbidity and has increased throughput and patient satisfaction with percutaneous hearing implants.

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Free Papers (F662)

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Congenital Inner Ear Malformations as a Cause of Single Sided Deafness

Presenting Author: **Emel Tahir**

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Learning Objectives: To understand the relationship with concurrent clinically significant inner ear abnormalities (IEMs) and single sided deafness (SSD). To increase awareness of the functional impact of SSD and its radiological findings which may influence the treatment of this condition. To interpret the treatment modalities of SSD by the help of radiological data and find out which IEMs constitute a contraindication to cochlear implantation.

Introduction: Single sided deafness (SSD) was a negligible entity until recently because of normal language development by the help of contralateral normal hearing. A Number of studies revealed that many SSD cases had concurrent inner ear malformations (IEM) which may influence the treatment plan of SSD. The aim of this study was to elucidate the prevalence and distribution of IEMs in congenital SSD which is crutial for the treatment.

Methods: This is a retrospective study of temporal bone CT and MRI findings of 77 consecutive patients 0–18 years old with congenital SSD. Cases with acquired etiology were excluded.

On MRI; the diameter, and signal intensity of the cochlear nerve (CN) were compared to the ipsilateral facial nerve. Also the width of the BCNC was measured on axial CT and it was defined as "stenotic"if the width was less than 1.5 mm.

The diagnosis of pediatric SSD is initially verified by pure-tone audiometry or ABR.

Results: 40 cases had normal CT&MRI findings whereas the remaining 37 had various IEMs. The most common pathology was BCNC stenosis/atresia together with CN deficieny(CND) seen in 27(72%) of the subjects. Interestingly this stenotic/atretic BCNC is seen in otherwise normal cochlear morphology which can be termed as ''isolated aperture atresia/stenosis''. Next in frequency were cochlear hypoplasias followed by incomplete partition I with 6 and 2 patients respectively. The most unexpected finding of the present study was the exceptionally high prevalence of CND accompanied by isolated BCNC stenosis/atresia as a cause of SSD rather than other IEMs.

Conclusions: All cases with SSD should have a CT in addition to MRI scan, because the prevalanceof BCNC anomalies with CND is very high in SSD.Since the non-functioning hypoplastic or aplastic CN together with BCNC atresia is a contraindication for CI, management of these patients is complex and BAHA could be an option.Cases with SSD should not be implanted before detailed evaluation of BCNC and CN.