

# **THE GRAHAM FRASER MEMORIAL FELLOWSHIP**

## **FELLOWS REPORT**

**2002**

**PETER REA**

### **Introduction**

It is a great pleasure to report on my time as the Graham Fraser Memorial Fellow from January to July 2002. The Fellowship has proved to be one of the great experiences of my career. The teaching of Professor William Gibson, coupled with the personal and practical support of the Trustees, and generous financial and organisational backing offered by the Fellowship, have made this year a tremendous success.

### **Preparation**

The Fellowship is well known and respected amongst otologists and trainees, and widely advertised, so the application process was well structured and competitive. The selection and interview process was formal and pleasant, though we had an anxious morning waiting by the computer for the outcome! The importance of the help provided in applying for the necessary visas and permits needs emphasizing. Organising work abroad can be complex and time consuming, but the paperwork provided by Dr Fraser in England and the guidance of Sue Alexander in Sydney allowed the process to run smoothly. The notes of other Fellows, and increasingly the personal contact between Fellows old and new, are making the preparation even easier, particularly perhaps for partners for whom the change in lifestyle is likely to be greatest of all.

### **Timetable**

Work is based around a two-week rolling timetable, and space can always be made to visit other centres. The whole week is spent with Professor Gibson, and there is no “service” commitment. Learning opportunities are therefore maximised.

	Monday	Tuesday	Wednesday	Thursday	Friday
Morning	<b>Clinic</b> (rooms) / Additional operating at The Children's / Visits to other centres	<b>Paediatric theatre</b> (Westmead Children's Hospital)	<b>Theatre</b> (Royal Prince Alfred Hospital)	<b>Paediatric theatre</b> (Westmead Children's Hospital) / <b>Clinic</b> (rooms) alternate weeks	<b>Theatre</b> (The Mater Hospital) / <b>Clinic</b> (rooms) alternate weeks
Afternoon	<b>Clinic</b> (rooms) / Visits to other centres	<b>Clinic</b> (Sydney Cochlear Implant Centre)	<b>Clinic</b> (rooms)	<b>Clinic</b> (rooms) alternate weeks	<b>Theatre</b> (The Mater Hospital) / <b>Clinic</b> (rooms) alternate weeks

### Surgical experience

The surgical exposure provided by the Fellowship is weighted towards the investigation and treatment of children and adults with profound hearing loss: in particular electrical testing and cochlear implantation.



Prof Gibson and Peter Rea in theatre



Cochlear implant surgery with Prof Gibson

Many of the cases are complex, and I know of no comparable period of training available anywhere in the world. A second thread is the investigation and surgical management of adults with vertigo, a subject in which Professor Gibson is also a world leader.

## **Electrophysiology**

At The Children's Hospital in Westmead one morning a week is spent investigating the nature of hearing loss in children, under general anaesthetic. The patient population includes a large proportion with extensive co-morbidity. The session is attended both by Professor Gibson and Halit Sanli his outstanding colleague who performs much of the electrical testing. They have developed a powerful combination of electrophysiological tools for investigating children with hearing loss. I performed 35 sets of electrical tests under general anaesthesia as well as observing many others. Auditory evoked brainstem response audiometry (ABR) is used throughout the world to investigate auditory thresholds and the central auditory pathways. I developed a much better understanding of its application. Round window electrocochleography is also performed on the children and provides an exciting insight into cochlear functioning. Learning this technique is undoubtedly a very important aspect of the Fellowship, and I discuss some of the implications in the research section. Electrical stimulation of the cochlear may also be performed (electrically evoked auditory brainstem responses) via this route. This combination provides a detailed assessment of auditory functioning and was a new experience for me. Despite my research background in electrophysiology the first sessions were undoubtedly bewildering as Prof and Halit hotly "debated" apparently identical responses, but with practice it all became clear! If I am able to secure an implant post as a consultant it would be something I would very much like to continue. I have no doubt that in certain cases, such as "auditory neuropathy" and children with multiple disabilities it provides information unavailable by any other means of testing. Other commercially available testing software was also utilised and being aware of the potential problems with the interpretation of results will prove important for me.

## **Cochlear implantation**

Cochlear implantation was undertaken both at The Children's Hospital, and at The Mater private hospital. I operated on 42 cochlear implants and 9 explants during the Fellowship, a remarkable number. Almost all were with Nucleus devices. 1 Clarion was reinserted. The range of pathologies was wide as with all implant programmes but the complexity of many of the cases was exceptional. I was exposed to a huge range of techniques to overcome difficult problems including CSF leaks, ossified cochlea, otosclerotic cochlea, common cavities and major cochlea dysplasias, rotated cochlea, blind sac closure, previous osteoradionecrosis, fractures, and revision surgeries. I learnt the challenging methods of cochlea drill outs, and the role of split arrays, including one child who received a bilateral split array.

Throughout all these procedures Professor Gibson's skill as a teacher and surgeon shone through. His hands-on tuition is one of the great strengths of this Fellowship. Each case was divided up into its separate stages with different steps undertaken on each case under close supervision, with every movement of the drill sympathetically critiqued. Shortcuts and tips were taught liberally. I took the opportunity to "relearn" skills and so was cautious and slow initially. But as the Fellowship progressed my confidence and

ability increased rapidly so that by the end I was able to perform implantation without supervision, and to a high standard.

The role of intra-operative electrical testing is very much advocated. Not only does this provide a wealth of research data, but helps subsequent threshold setting, and without doubt can identify device defects and placement errors very accurately whilst still in theatre, and so problems can be resolved before the patient comes out of theatre. The techniques advocated including electrical ABR seemed more reliable and provided more information than the commercially available packages. This will prove to be another useful lesson for the future.

### **Meniere's**

Surgery for Meniere's disease included endoscopic endolymphatic sac avulsion and labyrinthectomy. The endoscopic sac technique was developed by Professor Gibson, and the scientific rationale for it is attractive. It is also a fascinating operation to perform. Training in this technique is I believe unique to this Fellowship. Perhaps even more important than the surgical skills are the selection procedure for treatment which I discuss elsewhere.

### **Ossiculoplasty and stapedectomy**

I learnt several new techniques related to ossiculoplasty and stapedectomy. I enjoyed the training in stapedectomy particularly. I operated on a number of patients with otosclerosis including those with profound hearing loss in whom the excellent surgical result allowed them to function well with their stapedectomy plus a hearing aid, rather than a cochlear implant. Whilst there are several papers on this in the literature it remains an important learning point. Totally new to me was the role of intra-operative electrical testing at the end of the procedure to ensure satisfactory positioning of the prosthesis, and during the procedure to warn of impending problems. This contrasted well with techniques of other otologists I visited, who performed this surgery under local rather than general anaesthesia.

### **Additional surgical opportunities**

At the Royal Prince Alfred Hospital (RPA) opposite Professor Gibson's rooms, surgery is performed on both public and private patients. The timetable includes one session per week here. As this is a teaching hospital the local registrars are expected to assist with operations rather than the Fellow. This was an excellent opportunity to get to know the local team who were very welcoming both in theatre and socially. They were kind enough to allow me to perform several cochlear implants during their operating time.

The department is run with several other exceptionally talented and welcoming otologists and I took the opportunity of spending time with them in theatre. I was particularly impressed with Dr David Pohl's techniques for local anaesthetic stapedectomy and

ossiculoplasty, and the contrast between his arguments in favour of a local rather than general anaesthetic technique I have already mentioned. My mind remains open on the topic, though I do continue to use general anaesthesia for stapedectomy.

I visited Professor Paul Fagan at St Vincent's Hospital. He demonstrated why he has such a good reputation for mastoid surgery, and his flaps for covering the cavity were particularly appealing. I will certainly be using this technique in the future.

Dr Cathy Birman is a colleague of Professor Gibson at the implant centre and I was able to operate with her on several occasions at the Children's Hospital. She was very generous in what she allowed me to do, as well as being great company. We shared one particularly challenging reinsertion in which no features of the cochlea could be identified at all. It was during this that we developed a novel electrophysiological tool for identifying the cochlea lumen, which worked immediately, and is being written up.

### **Clinical experience**

Clinics were based at Professor Gibson's rooms opposite the RPA and the Sydney Cochlear Implant Centre in Gladesville. I sat in with Prof rather than saw new patients. This not only allowed me to observe all of the referrals, but debate management options and throw ideas about. Having this freedom to think and discuss freely is one of the great joys of the Fellowship. At his rooms there was a particular emphasis on the management of the dizzy patient. I hugely enjoyed discussing his theories on the aetiology of Meniere's, and his research dating back to his days in London. His management framework has allowed me to build up a very clear picture in my mind of exactly how I will manage such patients in the future. I still use his history-taking format, and took great pleasure on using it on two of his Meniere's patients I have since met at Queen's Square who still recall his time in London very well indeed.

Many of these patients underwent transyampic electrocochleography in his rooms. I performed 160 such procedures and am now clearly confident in using this as a diagnostic tool. It is less easily available in London and I frequently wish I could ask my patients just to pop next door for an ECOG! Developing a good understanding of its uses and limitations is another key element of the Fellowship.

Promontory stimulation testing of adult implant candidates is also performed at his rooms. I undertook 40 tests myself. The most startling result was a completely unexpected non-organic hearing loss. This is yet another key learning point of the Fellowship and the techniques are well worth understanding for the future.

I took advantage of several other clinical opportunities. This included The Flying Doctor Service. This was an interesting day out in to the outback. Landing in a 6-seater plane in a thunder storm with only a map and protractor to guide us through the lightning, and a

pilot claiming “never to have done this before” was, well, pretty Australian. The practical difficulties of managing disease in remote and poor populations were obvious.

I was also able to attend the Tri-Nations Congress in Perth, and the First Sydney BAHA course.

### **The Implant Programme**

Surgery is of course only one small part of the management of individuals with profound hearing loss. Patient selection, education, and (re)habilitation play a much greater part in the success of a programme. It is clear that if an implant programme is to succeed it is the vision, charisma, and dedication of those leading it that make it work. The resources of The Sydney Cochlear Implant Centre show what can be achieved. The audiologists, habilitationists, scientists, management and support staff were very welcoming. I was able to spend several sessions with each of the teams involved in assessing and training implantees in both the adult and paediatric programmes. I found understanding the management structure of the organisations helpful too, though of course funding arrangements are somewhat different to the UK.

I was also fortunate to be able to visit one of the outlying units affiliated to the centre that has been created specifically for the teaching of implanted children with multiple disabilities.

It is only on a Fellowship that so much time can be spent getting to know the processes involved in cochlear implantation both from the medical perspective, but also from that of the individuals and families affected. It was a great privilege being able to follow the progress of several children from diagnosis, through surgery, and to switch on. These experiences will always be with me as I wade through funding meetings in the years ahead.

### **Research**

The Fellowship offers as many research opportunities as can be handled. I had listed 9 possibilities by the end of my first week. Professor Gibson has collected an unrivalled database on his Meniere’s and implant patients, in particular their electrophysiology.

The following work has been produced:

#### **Publications:**

Rea P, Gibson WPR. *Evidence for surviving outer hair cell function in congenitally deaf children* (Submitted to **Laryngoscope**)

Rea P, Gibson WPR. *Otoacoustic emissions are not a suitable test for screening for deafness in premature neonates*. (We are preparing submission to the **AJO**, but will await acceptance of the

Laryngoscope article first. The work was presented in Oxford, 2002)

Rea P, Abrahams Y, Sanli H, Gibson WPR. *Severe otosclerosis. The pitfalls and outcomes of cochlear implantation* (For submission to **Laryngoscope**)

#### **Presentations:**

Rea P, Abrahams Y, Sanli H, Gibson WPR. *Severe otosclerosis. The pitfalls and outcomes of cochlear implantation.* **The 7<sup>th</sup> International Cochlear Implant Conference**, Manchester, 2002.

Rea P, Gibson WPR. “*Otoacoustic emissions are not a suitable test for screening for hearing loss in newborn infants.*” **8<sup>th</sup> International Congress of Paediatric Otorhinolaryngology**, Oxford, 2002.

#### **Posters:**

Birman C, Rea P, Sanli H, Gibson W. *The use of intra-operative EABR prior to insertion of a cochlear implant.* **7<sup>th</sup> International Cochlear Implant Conference**, Manchester, 2002.

The major work undoubtedly is the analysis of the database compiled by Prof over many years on the electrophysiological testing of children being assessed for cochlear implantation. Information on some 470 children was available. As well as the detailed information that was obtained on the ABR and round window electrocochleography, I was able to access almost every set of notes to profile potential risk factors for their hearing loss. It appears likely that children who have suffered hypoxia in utero or in the perinatal period may selectively lose the function of the inner hair cells of the cochlea whilst maintaining a disorganised response from the outer hair cells. This outer hair cell activity can be inferred from an abnormal positive potential characteristically seen on the round window electrocochleography. Yet ABR responses are absent (the child is deaf due to lack of activity in the region of the inner hair cells). This is important for two reasons. Firstly the *electrical* activity picked up as the abnormal positive potential (APP) may be the equivalent of the *acoustic* signal detected by otoacoustic emissions (OAE). We suggest that it is therefore possible to pass an OAE screen yet still have profound hearing loss. We showed a highly significant correlation between OAE and APP, we showed that 48% of children with hearing loss on NICU had OAE, and we found that 68% of deaf children born before 30 weeks gestation had APP (and so probably OAE). Secondly it is important as it contributes to the literature on auditory neuropathy, and we think suggests why so many do well with implantation. We submitted the article to the BMJ with the help of a friend who is an editor and were disappointed it was rejected as “important, of wide interest, but too technical.” We then submitted it to Laryngoscope and are waiting for a positive response. The work was presented in Oxford and generated a lot of interest.

It was very generous of Professor Gibson to allow me to be part of what has been such an important and longstanding project of his.

I also reviewed the 29 cochlear implants performed for severe otosclerosis, the largest published series in the world. Many interesting points arose from this work. It was presented in Manchester and will be published.

Additionally whilst assisting Cathy Birman with a challenging case, I hit on the idea of a stimulating probe, linked to ABR, to help locate the lumen of the cochlea. It was developed by Halit Sanli and has certainly proved useful. We submitted it as a poster and will find time to write it up soon.

### **Professor and Alex Gibson**

I hope that I have conveyed what an outstanding academic host Professor Gibson is: as a teacher, scientist, and leader. More than that, his humanity and compassion show through in all his work, his relationships with his patients and staff, and in his endless role as fundraiser for, and promoter of, the implant centre.

He was also a wonderful host socially. A holiday at the beach house, fishing trips out through the heads, entertaining both our families with champagne and oysters on the harbour, and funding my trip to The Tri-nations Congress in Perth, to name just a few opportunities.

From the moment we arrived both Prof and Alex made us feel welcome and at home. Alex was a great friend and support throughout our stay in Australia. She took many of the practical difficulties of moving a family abroad in hand, organising not only a trailer load of household goods, but also putting us in touch with her local friends and contacts. If ever problems arose she could be relied on absolutely to help resolve them. She truly welcomed us all in to her family.

Our son Oliver was diagnosed with a serious illness whilst we were in Sydney. Prof and Alex supported us, and shared our pain in a way I cannot put in to words. They alone know what it meant to us. Oliver is now a thriving two year old and asks every day to “go back.” Yannette and I will never forget their kindness

### **Summary**

The Graham Fraser Memorial Fellowship is thriving and offers otologists an experience that is unrivalled anywhere in the world. This experience can only benefit patient care in this country.

I would like to thank the Fellowship and Trustees for the huge amount of work that must have gone in to developing and funding such an outstanding organisation, and for their practical and sincere personal support during my time in Sydney.