To study advanced techniques in reconstructive surgery, particularly in relation to head and neck and breast cancers and composite tissue allotransplantation and large volume fat transfer.

Reported by Janet Huang 2010 Churchill Fellow

I understand that the Churchill Trust may publish this Report, either in hard copy or on the internet or both, and consent to such publication.

I indemnify the Churchill Trust against any loss, costs or damages it may suffer arising out of any claim or proceedings made against the Trust in respect of or arising out of the publication of any Report submitted to the Trust and which the Trust places on a website for access over the internet.

I also warrant that my Final Report is original and does not infringe the copyright of any person, or contain anything which is, or the incorporation of which into the Final Report is, actionable for defamation, a breach of any privacy law or obligation, breach of confidence, contempt of court, passing-off or contravention of any other private right or of any law.

Signed [Signature] Dated 18th February, 2012

The Winston Churchill Memorial Trust of Australia
INTRODUCTION

For the past decade, I have been pursuing a career in surgery. In the earlier years, my interests lay in solid organ transplantation and more recently in microsurgical reconstruction for cancer and trauma patients. Upon the completion of my plastic surgical program, I undertook further training as a fellow in the subspecialty fields of Head and Neck and Microsurgery as well as Facial Aesthetic Surgery. The face has always fascinated me, as surgery in the area is perceived as the most challenging in the body in that one needs to not only to restore function but also to reconstruct form aesthetically.

My public appointment is at the Princess Alexandra Hospital. It is the largest surgical hospital in the southern hemisphere. It is a teaching hospital of the University of Queensland Medical School and also a tertiary level teaching hospital for major medical and surgical specialties including solid organ transplantations. Our unit has a strong focus in head and neck reconstruction. We have an outpatient throughput of approximately 850 head and neck cases per year with the break-down of approximately 300 new patients, 100 review patients and the rest being discussion patients. Just under 200 patients are operated on each year for head and neck cancers and a significant number (50%) requiring plastic surgical reconstruction. I am faced with very complex and complicated reconstruction on weekly basis whether it be head and neck cancers, soft tissue sarcomas or breast cancer reconstruction.

While the reconstructive techniques currently available in Australia are good, they often only address the filling of a defect after cancer resection, they generally do not address the issue of function and even less so form. As a result, cancer sufferers are further disadvantaged by inferior and poor quality of life in their survival. This is particularly relevant to the head and neck tumours (both skin and intraoral cancers) as this group of patients often come from a lower socioeconomic background and more socially isolated group. Similarly applies to breast cancer patients, whilst we are very familiar with some reconstructive techniques, we have a more limited experience in patients with restricted donor site.

This report is not written in the form of a scientific paper but rather a reflection of my personal experience as the details are limited by the signed agreements with the respective institutions and as well as privacy and confidentiality issues. The centres selected are based on my past encounters with individual surgeons as well as the similarities in the patient population and their reconstructive
demands. One believes these centres provide reasonably good representation of the state-of-art reconstruction currently offered in the United States.

I am very grateful to The Winston Churchill Memorial Trust of Australia for the opportunity to travel as a fellow to the United States to investigate, observe and learn the newer and evolving techniques in microsurgical reconstruction in the bench-setting cancer care services.

I would also like to take the opportunity to thank the two people who acted as my referees during the application process: Drs Shireen Senewiratne and Daniel Rowe. They have both been my mentors and friends. Without their generous words of encouragement and support, this would not have been possible.

Finally, I would really like to thank everyone I have come across during my travelling fellowship as you have been amazingly inspirational and empowering. You, in addition to my patients both past and present, have all helped to shape me not only as a reconstructive microsurgeon but also as a person.
EXECUTIVE SUMMARY

Dr Janet Huang, MBBS (UQ), FRACS (Plast)
Plastic and Reconstructive Surgeon
Work Address: Princess Alexandra Hospital, Ipswich Rd, Woolloongabba 4102
Postal Address: PO Box 6530, Fairfield Gardens 4103
Telephone: (07) 3176 7934
Email: janethuang@ijve.com.au

Project Description
The goals of my fellowship was to study advanced techniques in reconstructive surgery, particularly in relation to head and neck and breast cancers and composite tissue allotransplantation and large volume fat transfer.

Highlights
Brigham and Women’s Hospital, Boston, Massachusetts, USA
    Julian J Pribaz, Bohdan Pomahac, Elof Eriksson
St Elizabeth Medical Centre, Boston, Massachusetts, USA
    Daniel Del Vecchio
R Adams Cowley Shock Trauma Centre
    Eduardo D Rodriguez
The Curtis National Hand Centre at the Baltimore Union Memorial Hospital
    James Higgins
NYU Langone Medical Centre- Institute of Reconstructive Plastic Surgery
    Joseph McCarthy, Robert Allen, Christina Ahn, Stephen Warren
Memorial Sloan Kettering Cancer Centre
    Peter Cordeiro, Andrea Pusic, Joseph Disa

Major lessons and conclusions learnt
- Stringent criteria needed to be applied in selecting the recipients, particularly their compliance and social support network
- Maximize the outcomes and minimize the risks of new innovative techniques through frank discussion and sharing of the approaches, results and setbacks
- Collaborative work is paramount in a multidisciplinary setting when managing complex reconstructions

Implementation and Dissemination
The acquired knowledge and skills can be disseminated at multiple levels. At the personal level, I will apply these to clinical practice and I will be able to offer
more reconstructive options to suitably selected patients. At the professional level, I aim to present the knowledge and skills gained where appropriate, for example in presentations to patients, their support groups, in health professional forum, clinical meetings and scientific conferences.

Since my fellowship, the first hand transplant has been performed successfully in Melbourne in March 2011. As there has been some delay in producing this report, I have shared the knowledge gained informally with my Melbourne Colleagues.
FELLOWSHIP PROGRAMME

Depart from Brisbane for Boston on 29th October, 2010

1st – 14th November, 2010
Boston, Massachusetts, USA
  - Brigham and Women’s Hospital
  - St Elizabeth’s Medical Centre

15th – 18th November, 2010
Baltimore, Maryland, USA
  - R Adams Cowley Shock Trauma Centre
  - The Curtis National Hand Centre at the Baltimore Union Memorial Hospital

19th – 21st November, 2010 (self-funded)
St Louis, Missouri, USA
  - QMP Reconstructive Surgery Symposium

22nd – 25th November, 2010
Baltimore, Maryland, USA
  - R Adams Cowley Shock Trauma Centre
  - University of Maryland Medical Centre

29th November – 1st December, 2010
New York, New York, USA
  - NYU Langone Medical Centre - Institute of Reconstructive Plastic Surgery
  - Memorial Sloan Kettering Cancer Centre

2nd – 4th December, 2010 (self-funded)
New York, New York, USA
  - 30th MEETH meeting

6th – 20th December, 2010
New York, New York, USA
  - NYU Langone Medical Centre - Institute of Reconstructive Plastic Surgery
  - Memorial Sloan Kettering Cancer Centre

Depart from New York for Brisbane 21st December, 2010
MAIN BODY

We live in the era of advanced and sophisticated microsurgery, however, immediate microsurgical replantation is not always a feasible or a reliable option. This is particularly true in the settings of trauma with complex aetiologies or with the involvement of composite tissues or facial subunits, such as gunshots or burns. It then falls back onto delayed autologous or prosthetic reconstruction to replace what is missing. On the other hand, as I work in Brisbane, the skin cancer capital of the world, I am frequently confronted with very advanced skin malignancies which involve a large percentage of the face, for example areas involving both the eye and the nose. The challenge then lies in how these patients' appearance can be restored so they can not only look normal but live a life with reasonable quality.

As a reconstructive surgeon the dogma has always been replacing like tissue with like tissue. Face allotransplantation has become a reality since November 2005, towards the end of my first year training in Plastic Surgery. I followed the first and subsequent case reports with great excitement and intense fascination, as this is really a marriage of my favourite two areas of modern-day surgery: organ transplantation and microsurgery.

Central face is specially challenging since this is the keystone area of the face and the defects in central face can often involve more than one organ structure. Composite Tissue Allotransplantation (CTA) has added an interesting dimension the reconstructive armamentarium. The controversy remains does the improvement in quality of life justified by the risks of lifelong immunosuppression with long-term sequelae of renal toxicity, opportunistic infections, diabetes, avascular necrosis and cutaneous malignancies.

The goals of my fellowships were

1. To investigate the surgical techniques which provide superior options for reconstruction of complex facial defects including but not limited to subunit and total face transplant for head and neck trauma and cancer patients and the role and techniques for large volume fat grafting in breast cancer reconstruction patients

2. To investigate and optimize the aspects of the procedure of composite tissue allotransplantation
   a. Clarification of indications
   b. Matching criteria (recipient selection and donor recruitment)
   c. Surgical planning and rehearsals including organ procurement
   d. Postoperative care and immunosuppressive protocols
3. To investigate what quality of life assessment tools, data and follow-up protocols these centres currently have in place for cancer reconstruction as well as face transplants to justify the choice of reconstructive methods and the sequelae of life-long immunosuppression respectively

4. To see if the cost-effectiveness of the chosen reconstructive methods are able to be measured or assessed

**Boston, Massachusetts, USA**

*Brigham and Women's Hospital*

*75 Francis Street*

*Boston, MA 02115*

**Key Persons**

*Dr Julian J Pribaz – Associate Chief of Plastic Surgery*

*Dr Bohdan Pomahac – Director of Plastic Surgery Transplantation*

Brigham and Women’s Hospital has a long tradition of being the pioneers in Plastic Surgery and other fields. Dr Joseph Murray performed the first kidney transplant between identical twin brothers in 1954. Almost fifty years later, the field of transplantation has been expanded by the successful performance of the first male partial face transplant led by Dr Bohdan Pomahac.

I had the opportunity to spend time with Professor Julian Pribaz who is a forward thinker and has published very extensively in Plastic Surgery literature, particularly in the fields of head and neck and breast reconstruction. His special interest areas include microsurgery, lymphedema surgery and management, vascularized tissue transfer for traumatic limb amputation as well as CTA for both trauma and cancer patient.

I also spent time with Dr Bohdan Pomahac and was fortunate enough to coincide my visit with a review appointment of James Makei where I observed the assessments performed on the recipient at 18 months post CTA as well as privileged to discussions in terms of the indications, rationales and planning of the revisional surgery.

I was taken through the renowned Tissue Engineering and Wound Healing Laboratory to see the set-ups and was introduced to the current projects and animal models relevant to the researches pertaining to CTA.
Key points learnt

Clinic follow-up assessments for its first partial face transplant
Composite Tissue Allotransplantation animal models
Techniques in managing complex head and neck cancers
1st hand experience with the non-vertical scar breast reduction
(or Boston modification of the Robertson technique)
Revisional surgery for breast reconstruction
Post adjuvant therapy or complicated postoperative course
Following surgery with suboptimal aesthetic outcomes
To investigate and optimize the aspects of the procedure of CTA

Clarification of indication
Defects impossible to restore with conventional techniques such as complex defects involving perioral and/or periorbital subunits
Children with congenital defects due to the possibility of developing durable chimerism and tolerance, allowing for potential to withdraw immunosuppression, hence its long-term deleterious effects, however, issues with informed consents in this group needs to be established
Locally aggressive benign pathology such as neurofibromatosis or vascular or lymphatic malformations
Devastating infectious aetiologies such as noma
Patients with “life-limiting” facial deformities documented by patient-reported outcome measures such as Short Form-36 and the Facial Disability Index

Matching criteria (recipient selection and donor recruitment)
Compliant recipient is a critical factor in achieving and maintaining a successful facial CTA
Exhaustive Work-up
Bloods and imaging and other investigations as indicated
Primary matching criteria – human leukocyte antigen, iral serology matching
Secondary matching criteria: age, skin tone, gender, race, and skeletal buttress size

Thorough multidisciplinary team assessment is paramount including and not limited to
1. Plastic surgeons
2. Maxillofacial surgeons
3. Head and neck oncologist/Ear mnose and throat surgeons
4. Psychologists/psychiatrist
5. Social workers
6. Transplant physicians
7. Allied health professionals
8. Patient advocate

**Informed consent – discussion including**

Current practice for treatment of facial deformities and reasons for considering CTA

Transplant specific considerations including – life-long immunosuppression, worsening in end-organ function and form, death from overwhelming infections

**Surgical planning and rehearsals including organ procurement**

3-D imagining to determine the surgical defect and recipient vascular status

Design of the allotransplant – based on elements of the defect and angiosomes

Detailed surgical planning in step-wise manner and mock cadaveric dissection

**Postoperative care and immunosuppressive protocols**

ICU care immediately postoperatively for invasive and flap monitoring

Nurse head up to facilitate venous outflow

NBM except with meds

Nutritional support from day 1

Adequate analgesia

Anticoagulation with aspirin only

Early mobilization

Immunosuppression

- Triple-drug standard maintenance regimen includes tacrolimus, mycophenolate mofetil and prednisolone
- Possibility of two-drug therapy with low-dose and steroid wean-protocol
- Consideration of donor-derived bone marrow infusion or use of vascularized bone marrow

**Objective assessment of aesthetic, functional and social outcomes**

Objective measures of facial function to determine both motor and sensory recovery by functional magnetic resonance imagining, electromyelography/nerve conduction studies and pressure-specified sensory device testing
St Elizabeth's Medical Centre
736 Cambridge St
Brighton, MA 02135

Key person
Dr Dan Del Vecchio – a pioneer in large volume fat transfer

Fat grafting is a surgical procedure which involves harvesting the patient's own fat and then transferring it to a different body site to augment soft tissue volume. Since it is autologous tissue, it is therefore not subject to rejection. This has been used for cosmetic breast augmentation as well as following breast cancer surgery.

Fat grafting is by no means a novel procedure. The earliest report dates back to 1895. The initial techniques were described for small volume transfers only. I spent 3 days with Dr Del Vecchio learning the intricacies of large volume fat grafting as his name is commonly akin with such. The donor sites are prepared as per liposuction, the fat is then harvested and collected “in line” in a sterile canister. It is allowed to sit and let it separates into layers. It is not enriched with stem cells, platelet rich plasma, or other additives. The fat is then centrifuged in 60 ml syringes in a machine designed by Dr Del Vecchio which allowed the operative times to be reduced to two hours or less.

Key points learnt
Techniques in harvesting, preparing and transferring fat grafts
Optimal instruments for large volume fat harvesting and transfer
Scientific data on coupled pre-expansion and autologous fat transfer
Radiological evidence of volume retention short and medium term
Future application of fat transfer

Baltimore, Maryland, USA

R Adams Cowley Shock Trauma Centre
22 S Greene St
Baltimore, MD 21201

The Curtis National Hand Centre at the Baltimore Union Memorial Hospital
3333 North Calvert St
Baltimore, MD 21218
Key Persons

Dr Eduardo Rodriguez – Chief of Plastic and Reconstructive Surgery Service
Dr James Higgins – 2010 Godina Travelling fellow

R Adams Cowley is considered the father of trauma care and gave the world the concept of the Golden Hour. The R Adams Cowley Shock Trauma Centre is the USA’s first and only integrated Trauma Hospital. Their mission is to provide rapid response to the severely injured with the ultimate goal to save their lives.

Dr Eduardo Rodriguez is the current Chief of its Plastic and Reconstructive Surgery Service. He has done extensive fellowships in well-known centres in Taiwan and also in the USA in the fields of head and neck and microsurgery as well as maxillofacial surgery.

Dr James Higgins was the 2010 Godina Travelling Fellow which is a prestigious award given by the American Society of Reconstructive Microsurgery. He gave a very eloquent full day workshop on upper limb anatomy and functional tendon transfers post injury.

Key points learnt

- Composite Tissue Allotransplantation animal models
- Techniques in managing complex facial injuries
- Integrated care of trauma and immediate reconstruction
- Functional reconstruction of the upper limb/hand

St Louis, Missouri, USA

QMP Reconstructive Surgery Symposium
The Ritz-Carlton
100 Ritz-Carlton Dr
St Louis, MO 63105

Key points learnt

- Didactic teaching of the latest in complex wound reconstruction
New York, New York, USA

Memorial Sloan-Kettering Cancer Centre
1275 York Ave
New York, NY 10065

Key Persons
- Peter Cordeiro – Chief of Plastic and Reconstructive Surgical Services
- Andrea Pusic – Plastic Surgeon
- Joseph Disa – Plastic Surgeon

Memorial Sloan-Kettering Cancer Centre is the world’s leading centre in cancer surgery. It was the first centre to develop services specifically dedicated to psychiatric aspects of cancer. It sees more than 3500 head and neck cancer patients per year.

I visited Dr Peter Corderio who is the Chief of the Plastic Surgery Service. He has an interest in the microsurgical reconstruction for breast and head and neck cancers. He is a leader in innovative techniques and approaches to reconstructive patients who have been previously irradiated for their breast cancer.

I also had the opportunity to hear Dr Andrea Pusic has the expertise in breast cancer reconstruction and she is known for the BREAST-Q which is an outcome assessment tool to determine patient’s body image, psychological, social, sexual and physical functions as well as care satisfaction. I was very interested to see if there is a similar tool for head and neck patients.

Dr Jospeh Disa specializes in microsurgical reconstruction following cancer resection with a specific interest in breast as well as head and neck cancers. I observed many breast reconstruction cases with free tissue transfers.

Key points learnt
- Techniques in managing complex defects post cancer resection
- Head and neck cancers
- Breast cancers
- Integrated multidisciplinary care of cancer patients
- BREAST-Q
Institute of Reconstructive Plastic Surgery
Tisch Hospital, NYU Langone Medical Centre
550 1st Ave
New York, NY 10065

Key Persons
Joseph McCarthy – Chair of Plastic and Reconstructive Surgery
Robert Allen – Clinical Professor
Christina Ahn – Associate Professor
Stephen Warren – Associate Professor

I was invited by Professor Stephen Warren to visit NYU when we cross path at the European Plastic Research Council Meeting in August 2010. This had not been a planned part of my fellowship. The visits to NYU is the high light of my fellowship as I found much similarities between our patients.

In my first day, I watched the world’s first bilateral profunda artery perforator (PAP) flap for breast reconstruction, performed jointly by Drs Robert Allen and Christina Ahn. I watched a couple more in the following weeks. Dr Allen is a pioneer in autologous breast reconstruction. He has described many other workhorse flaps in breast reconstruction. This is now becoming a second-line option in patients without adequate abdominal tissue. I had exposure to multiple complicated cases of head and neck cancers and lower limb sarcomas also.

Key points learnt
First hand experience of the world’s first bilateral profunda artery perforator flaps for breast reconstruction
Indication of fat grafting
Adjunctive use of fat grafting to correct minor contour deformities
Complex facial reconstruction for congenital and acquired conditions
Indications of fat transfer
Latest application of fat grafting and supporting data

30th MEETH Meeting
Grand Hyatt Hotel
109 E 42nd St at Grand Central Terminal
New York, NY 10017

Key points learnt
Updates on basic science of fat grafting
New indications of fat grafting
Latest application of fat grafting and supporting data
CONCLUSIONS

There has been 18 face transplants performed world wide since 2005 and it is an extremely exciting and rapidly evolving field. Early results have promisingly demonstrated it is a superior option of complex facial reconstruction. Since I completed my fellowship, more details have been released in most of these cases. Short-term data and early results have shown it is perhaps justified, however, there has been no formal quality of life assessment tools used to quantitatively documented it.

RECOMMENDATIONS

There is a need for a national strategy following the foot-steps of the leading plastic surgery centre to establish a face transplant programme.

There is a need to develop some form of quality of life assessment tools pertinent to head and neck cancer following oncological resection and reconstruction. These data will enable surgeons to choose the most appropriate reconstructive methods to enhance patients quality of life. This can be incorporated in to the algorithm when assessing patients.

It is important to establish a national consensus in terms of large volume fat transplantation based on short- to medium-term data currently available.