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*The completed Annual Report should be sent electronically by 31 May to:*

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## Trends in surgical procedures

There were 8 procedures carried out during the year, which break down as follows:

■■■ were explorations of the brachial plexus nerves with nerve grafting. The outcomes of nerve repair procedures continue to be closely audited as detailed in the 2011-12 report.

■■■ patients had manipulation of the shoulder and Botox injections to relax contracted muscles. We are monitoring the efficacy of these procedures.

■■■ child had open release of muscles at the shoulder and reduction of dislocation. This represents a reduction in requirement for this type of surgery compared with previous years. The indications for the surgery have not substantially changed, so the reasons for this trend are not clear. It is possible that earlier physiotherapy/surgical intervention is reducing the number of children with shoulder contractures severe enough to warrant surgery.

■■■ ■■■■ ■■■ had a free muscle transfer to strengthen elbow flexion. This type of later reconstruction has been an important addition to the reconstructive options offered by the service since Professor Hart, Plastic Surgeon joined the team.

■■■ ■■■ had a plate, inserted at an earlier osteotomy procedure, removed.

■■■ ■■■■ had resection of a sarcoma involving the brachial plexus. The procedure was carried out in conjunction with the Orthopaedic Bone and Soft Tissue Tumour Service.

### **B2 b) Clinical Outcomes/ complication rates / external benchmarking**

Covered in other parts of the report.

### **B2 c) Service Improvement**

#### **Occupational Therapy**

Following agreement by NSD to fund 0.3 WTE for Occupational Therapy, Nicky Hart was recruited and has commenced involvement in the paediatric service at Yorkhill hospital.

The role of OT since attending the clinic has been to be involved in the multidisciplinary team in the clinic setting.

#### **Reasons for Referral to OT:**

Functional upper limb assessments  
ADL/ PADL/ DADL assessments  
Play development  
Provide strategies and advice

## **Treatments:**

Initial out-patient assessments at Yorkhill.

Provide advice to nurseries and schools particularly at transition times (nursery to school and primary to secondary).

Liaison with social work departments regarding any home adaptations.

Liaison with community OT's out with GG&C.

Provision of small pieces of ADL equipment for home and link with education.

Provision of therapeutic activities and exercises, eg, theraputty.

Provide strategies and advice to older school age children.

Attend outpatient clinic in conjunction with surgeons to assess and provide advice at the appointment.

## **Future Plans:**

OT to be involved in younger age group to provide advice regarding sensory play and positioning.

To be more involved with Physiotherapy colleagues regarding exercises and how these can be incorporated into everyday activities.

## **Physiotherapy**

During 2012 Heather Farish has updated the referral guidelines for the maternity hospitals to ensure that all babies born with an OBPP are referred to physiotherapy on discharge from the maternity hospital. This was done to highlight the importance of physiotherapy in the early stages prior to their clinic appointment and to ensure we could offer all babies an appointment with 7-10 days after birth. It is planned to further increase communication with maternity units across Scotland.

With the appointment of an Occupational Therapist for the service it is hoped that over the coming year physiotherapy can work jointly with occupational therapy for certain patients who would benefit from a joint approach.

## **Young Adult Clinic**

Some patients who are still followed up in the children's brachial plexus clinic are now age 16 or over. In addition some referrals are received for adults who have ongoing problems resulting from OBPI. It was felt inappropriate to continue to see these patients in the children's clinic. Therefore a new clinic for young adults has been started the first being held in April 2011. The clinic is at the New Victoria Hospital, Glasgow, the same location as the adult brachial plexus clinics. The clinical nurse specialist, occupational therapist, and physiotherapist who work with the adult service are contributing. The clinic is continuing on a twice yearly basis.

## B2 d) Research

### Tim Hems

During the year a paper presenting the results of a long standing project on the outcome of surgery for shoulder deformity in OBPI was published.

Based on this experience, Tim Hems was invited to give a lecture entitled, “Internal rotation deficit after surgery for internal rotation contracture of the shoulder in obstetric brachial plexus injury,” at the Congress of the International Federation of Societies for Surgery of the Hand held in Delhi, India. (7<sup>th</sup> March 2013).

Tim Hems with Terence Savaridas (Specialist registrar in Orthopaedics) have continued a project to quantify elbow flexion strength in children who have had obstetric brachial plexus injury (OBPI). Although it is known that elbow flexion usually recovers to a functionally useful level after OBPI this has not been formally quantified.

The study involves measuring elbow flexion strength in children over the age of 5 attending the outpatient clinic using a hand held dynamometer. Ethical approval has been obtained. Data collection has been completed and we are moving on to analysis.

### Publications

Sibinski M, Hems, T.E.J., Sherlock DA. Management strategies for shoulder reconstruction in obstetric brachial plexus injury, with special reference to loss of internal rotation after surgery. *Journal of Hand Surgery: European Volume*, 2012, 37E, 772-779.

### Andy Hart

During the year 2012-2013 Prof. Hart has been engaged with the following research work of direct relevance to brachial plexus injury:

- Psychological impact of obstetric brachial plexus injury (OBPI) – a junior surgical fellow has now received NRES approval to commence a planned project that will utilize validated psychological scales to assess two elements of relating the OBPI. These will be applied over the next 18 months to accrue a sufficient dataset for analysis:
  - To investigate the parental response to the diagnosis of their child with OBPI, the information presented to them, and the timing of various investigations & interactions with healthcare workers.
  - To investigate the impact of OBPI upon a child’s psychosocial and psychosexual development (body image, social confidence, etc.)
- University of Glasgow:
  - “**Electro-active nano-patterned construct with integral solenoid activity for nerve reconstruction**” (Aug 2009 – Oct 2013, Stephen Forrest Trust, £200K) I have two linked PhD projects ongoing (now in their final year) which investigate the role of surface topography (micro- & nanoscale) and bioelectronic stimulation upon the regenerative profile of peripheral nerve repair constructs. Both projects are progressing well towards conclusion, and initial work has been presented internationally. Spin-off projects for several MRes students have been generated.

- **CrackIt DRGnet Phase 1** (Dec 2012 – June 2013, MRC / NC3Rs £100K grant over 6 months) this is to establish a legal, ethical, and viable system for the provision of human sensory neurons (DRG origin) for use across Europe by researchers developing pain medications, including those to treat nerve injury
  - RCSEd Small Grant Award (£10K): examining the intracellular effect upon regeneration associated gene activity of different polymer substrates & surfaces for use in nerve repair constructs. This work will help a plastic surgery trainee build her case for full time PhD funding, and grant submissions to Wellcome are in process.
  - I have three part-time surgical research fellows.
    - one is focused upon the CrackIt grant
    - one is focused upon the extraction of adipose-derived stem cells (ADSC) & stromal vascular fraction (SVF) for use in peripheral nerve regenerative medicine
  - Anatomy of the suprascapular nerve: dissection & radiological investigation of anatomy as pertains to brachial plexus injury & reconstruction – this small scale study was undertaken by a medical student, and is being written up this year.
- Collaborative research group
    - I maintain links with colleagues in the Universities of Umea (Sweden) & Manchester that focus on peripheral nerve repair (tissue engineering, neuronal protection, adjuvant pharmacotherapy, timing of nerve repair). A multicentre clinical trial of neuroprotective pharmacotherapy in major nerve injury is under development.
    - Output has included the first clinical studies to validate the use of volumetric MRI as a measure of nerve injury induced neuronal death, and to demonstrate the neuroprotective benefit of early nerve repair in major nerve injury.

*Presentations of Direct Relevance to Brachial Plexus Service*

1. “Peripheral nerve injury” MRC trauma reconstruction workshop, Birmingham 2012
2. “Reconstruction of major peripheral nerve injury - clinical options and neurobiological research strategies” Glasgow Royal Infirmary Grand Round 24<sup>th</sup> April 2013
3. “Cadaver investigation of the functional anconeus free flap for thenar reconstruction” Ng ZY, Mitchell JH, Fogg Q, Hart A. 2012 Annual Meeting of the American Association for Hand Surgery

*Publications of Direct Relevance to Brachial Plexus Service*

1. Reid A., Terrenghi G., Wiberg M. & Hart A “Pharmacological Treatment as an Adjunct to Surgical Procedures in Nerve Injury” Federation of European Societies for Surgery of the Hand instructional course book 2013
2. “Report of the MRC trauma Reconstruction Workshop 2012” Hart A et al 2012: In this report reviewing the whole of reconstructive biological and surgical research (subsequent to a 2 day expert panel workshop with >40 invited delegates), the case for brachial plexus injury research to have primacy was clearly accepted by the workshop group, and was made to the MRC, as it frames its forthcoming round of major trauma grant calls.
3. West C, Hart AM, Terrenghi G, Wiberg M “Sensory Neurons of the Human Brachial Plexus: A Quantitative Study Employing Optical Fractionation and In-Vivo Volumetric Magnetic Resonance Imaging” Neurosurgery 2012 May;70(5):1183-94 [I.F. 2.785]
4. Chin K., Vasdeki D., Hart A. “Inverted Free Functional Gracilis Muscle Transfer for the Restoration of Elbow Flexion” Journal of Plastic, Reconstructive & Aesthetic Surgery 2013;66:144-146

5. Ng Z., Mitchell JH, Fogg Q., & Hart A.M. “Functional Anconeus Free Flap for Thenar Reconstruction: A Cadaveric Study.” Hand 2012
6. Terenghi G, Hart AM & Wiberg M “The nerve injury and the dying neurons: diagnosis & prevention” JHS(European) 2011 Nov;36(9):730-4 [IF 1.093]

Honorary & other Appointments received 2012-2013 in reflection of neurobiological research activity:

Senior Research Associate, Centre for Cell Engineering, University of Glasgow 2012  
Chair, The MRC Trauma Reconstruction Workshop Group  
Educational lead, Canniesburn Plastic Surgery PSU  
Scientific advisor to organising committee, ESPRAS Meeting 2014  
Scientific advisor to organising committee, EURAPS Meeting 2015  
Member, British Association of Plastic Reconstructive & Aesthetic Surgeons Academic Group, 2012 onwards  
NICE adviser on the assessment of Phrenic Nerve Transfer for use in brachial plexus injury reconstruction

**B3 Safe**  
**B3 a) Risk Register**

All healthcare professionals funded within the structure of the Obstetric Brachial Plexus Palsy Service meet Greater Glasgow & Clyde Trust requirements for vetting by Disclosure Scotland, and registration with the Information Commissioner’s Office.  
Miss Claire Murnaghan has certified level 3 Child Protection training.

**B3 b) Clinical Governance**

Patients reviewed, or treated at the RHSC Yorkhill site fall under the hospital’s own governance system, reinforced by internal audit within the Orthopaedic, and the Plastic Surgery Services. No significant governance issues have been identified through these mechanisms during 2012-2013.

**B3 c) Healthcare Associated Infection (HAI) and Scottish Patient Safety Programme (SPSP)**

The outpatient clinic has fully adopted recommendations on hand hygiene, dress code, and cleaning of equipment as recommended nationally. These measures are also in full implementation within the inpatient ward, and theatre complex used. Regular monitoring of compliance within the hospital is performed by assessors independent to the Plexus Service. No peri-operative bacterial infections occurred during the period 2012-2013.

**B 3 d) Adverse Events**

The service uses existing Greater Glasgow & Clyde thresholds for instigation of adverse event reporting and investigation, plus online reporting systems. No adverse events have been reported to occur during the period 2012-2013.

### **B 3 e) Complaints / Compliments**

Complaints are handled by the Complaints Liaison Officer, as per the NHS Complaints Procedure. Information leaflets regarding the complaints policy are available from any member of staff at RHSC.

### **B4 Timely (Access)**

#### **B4 a) Waiting / Response Times**

The mean time between referral and first consultation was 16.1 days (range 0 days to 117 days).

Most referrals are sent centrally Miss Murnaghan at RHSC by letter, fax or via the electronic vetting system for those who are not directly referred by the maternity units.

The urgency of the referral is graded when it is received. The response times have been appropriate to the condition of the patients. The longer delays were as a result of patients not attending the first appointments offered to them.

#### **B4 b) Review of Clinical Pathway**

##### **(i) Review and Changes to Clinical Pathway**

Insert text here

##### **(ii) Improvements to Local Delivery of Care**

Recent education and liaison with maternity units in Greater Glasgow and Clyde and Forth Valley have led to a more stream-lined approach to referral to the Brachial Plexus service, with simultaneous referral to Miss Claire Murnaghan and Miss Heather Farish to ensure that no referral should have a delay in being appointed to the Service, secondary to leave. We have requested that referrals should be made more promptly after birth in order to review the baby soon after birth and ensure that the appropriate information is given to the parents from the outset. As the clinics run on a 3 or 4 weekly basis, patients will be seen as an outpatient in the physiotherapy department in the interim.

### **B5 Person Centred**

#### **B5 a) Patient Carer/Public Involvement**

Insert text here

#### **B5 b) Better Together Programme Involvement**

Patients and their families benefit from early review by a multidisciplinary team at the Paediatric brachial plexus clinic and are given contact details for our named therapists in order to maintain a close relationship during their treatment. They are given the opportunity to ask questions and find out more information about their diagnosis and are actively involved in the care of the child, particularly through sharing of information and responsibility for exercises and therapy.

### **B5 c) User Surveys**

None performed during the last year.

## **B6 Equitable**

### **B6 a) Fair for all: Equality & Diversity**

The Plexus service complies with NHS rules on equality & diversity in the appointment of staff. Similar care is taken in providing equal care standards to patients and relatives. Appropriate use of interpreters, and awareness of cultural, ethnic and religious practices in regard to examination and interaction with parents is facilitated.

### **B6 b) Geographical access**

**Outreach Clinics:** In order to assess and follow-up patients from the North East of Scotland a clinics was held at Woodend Hospital, Aberdeen in November 2012. Clinics are held approximately every 6 months depending on demand and seem well received by the patients. Adult brachial plexus patients and children are seen in the same clinic.

The need for clinics in other locations is under review.

## **Section C : Looking Ahead/Expected Change/Developments**

### **Physiotherapy**

Work is in progress on developing a physiotherapy information booklet for the brachial plexus palsy service to give parents a greater understanding of the importance of physiotherapy for their new baby. This booklet will also be available to community physiotherapy staff which will improve consistency of information.

### **Psychological Support**

It is recognised from pilot work, from patient-group feedback, and from international studies that parents and children with OBPI suffer variable levels of psychological morbidity, with many suffering severe morbidity. Children, parents and families will require assessment and targeted support and counselling (when indicated) at various points during their care, most typically at the following times:

- 1) Around the time of diagnosis assisting parents and families to with bonding, guilt, grief reactions, and interpersonal relationship difficulties. Many parents would benefit from assistance as they learn to manage emotions surrounding shoulder physiotherapy exercises, and again when the child becomes old enough to withdraw co-operation.
- 2) During the necessary 3 - 6 month period of expectant management until the level of nerve recovery can be stratified a firm prognosis developed, parents & families require assistance managing uncertainty. Should surgery be necessary (eg need for nerve exploration, open reduction of shoulders, botulinum toxin injections) they require significant input relating to the complex decision making process, and then managing their child in cast for ~1 month post-surgery.

- 3) Pre-school: Therapy should begin the process of teaching the child body awareness, and management of others reactions to their appearance or disability.
- 4) Starting school: the development of personal body image and the establishment of peer relationships including perception by peers.
- 5) During adolescence and early psychosexual development
- 6) In the late teens as career choices are made, and decisions reached about driving and independent living

Currently, some children have been referred to the Department of Clinical Psychology but they have to wait on a common waiting list and so often the time-frame for intervention is longer than appropriate.

There is also an issue with equity of access nationally.

We intend to develop proposals for dedicated professional support for children with OBPI and their families and believe it is important that the person providing this has good knowledge of the condition, and good working relations with the rest of the service.

### **Patient Information**

The previously identified need to revise the parental information pack has been acted upon, but is progressing slower than predicted. Assistance from NSD was offered during the last meeting, and requires integration with the terms of parental information packs required by Yorkhill Hospital. Draft documentation has been prepared and is under review. The current information pack is under review by the hospital FILES committee, prior to being passed to Medical Illustration.

## **Section D : Summary of Highlights (Celebration and Risk)**

Activity levels within the Obstetric Brachial Plexus Injury Service have remained similar to previous years. During the last year important developments have been made in respect of physiotherapy, brachial plexus exploration and repair, ultrasound of the shoulder, development of secondary procedures for forearm rotation, and the young adult clinic. Formal occupational therapy provision has commenced, as has improved outreach interaction with referring services. An increasing number of junior trainees are becoming involved with the service.

The multidisciplinary team remains the basis of the success and ongoing development of the service. As well the work in the clinics, there has been considerable out-patient physiotherapy activity. In addition to those already mentioned in the report operating theatre staff have given skilled assistance in surgical cases.

## **Appendix**

### **Teaching and Training Activity**

#### **Heather Farish, Physiotherapy**

In the physiotherapy department we now have 3 band 5 physiotherapists rotating through the different teams. Heather therefore provides teaching on OBPP to the band 5 physiotherapist working within the musculoskeletal team. This includes information on the condition, the OBPP service and assessment and treatment of these babies. As part of their competency document for their rotation they are required to shadow assessments of new babies with OBPP and also come to the clinic.

Heather has also provided teaching on OBPP to the physiotherapists working in Maternity services at the Southern General Hospital. This was to improve their knowledge of OBPP and appropriate early management prior to discharge home from the maternity hospital.

#### **Claire Murnaghan**

Talks to:

- |                                |  |
|--------------------------------|--|
| September 2012                 | Neonatal Unit Southern General hospital  |
| 13 <sup>th</sup> December 2012 | Southern General Hospital midwives   |
| 20 <sup>th</sup> December 2012 | Neonatal unit Princess Royal Maternity hospital, Glasgow                           |
| 31 <sup>st</sup> January 2013  | National Neonatology Study Day (100 UK delegates) at Grand Central Hotel, Glasgow. |
| 12 <sup>th</sup> March 2013    | Neonatal unit and Physiotherapists, Forth Valley Hospital.                         |

#### **Tim Hems**

- |                                |  |
|--------------------------------|--|
| 24 <sup>th</sup> April 2012    | Edinburgh Hand Surgery Course.<br>“Management of Brachial Plexus Injuries”. Included OBPI.   |
| 23 <sup>rd</sup> November 2012 | Scottish Plastic Surgery Training Program and Aberdeen Orthopaedic Training Programme.<br>All day symposium on Traumatic and Obstetric Brachial Plexus Injury, with patient presentations. |

#### **Andy Hart**

- |                                |  |
|--------------------------------|--|
| 23 <sup>rd</sup> November 2012 | Scottish Plastic Surgery Training Programme and Aberdeen Orthopaedic Training Programme.<br>All day symposium on Traumatic and Obstetric Brachial Plexus Injury, with patient presentations. |
| 16 <sup>th</sup> November 2012 | University of Glasgow Masters by Research in Cell Engineering – Tissue Engineering & Major Peripheral Nerve Injury.  |

10<sup>th</sup> January 2013 Brachial Plexus Injury & The Scottish National Brachial Plexus Surgery Service – presentations to the Orthopaedic Department, and then to the Paediatric Department, Dumfries & Galloway Royal Infirmary.

27<sup>th</sup> February 2013 Obstetric Brachial Plexus Injury – Occupational Therapy Network Meeting.

Regional Plastic Surgery teaching program - Brachial Plexus Reconstruction, and the response to injury (March 2013).

1 Medical Student Special Study Modules (University of Glasgow student), focusing on brachial plexus reconstruction.