



SCOTTISH NATIONAL OBSTETRIC BRACHIAL PLEXUS INJURY SERVICE

ANNUAL REPORT

2009-10

**Scottish National Obstetric Brachial Plexus Injury Service
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Summary

The Children's Brachial Plexus Service provides a service for assessment, investigation, physiotherapy, and, when appropriate, surgical reconstruction for obstetric brachial plexus palsy. The service has continued to be busy with a total of 38 new cases assessed and 7 admitted for nerve reconstruction and surgery. Activity remains similar to previous years.

During the year David Sherlock, Consultant Paediatric Orthopaedic Surgeon, retired and has been replaced by Claire Murnaghan. She has brought new skills, including the use of ultrasound for assessment of the shoulder in patients with obstetric brachial plexus palsy. Together with the involvement of a Plastic Surgeon this further widens the range of skills available for assessment and reconstruction for brachial plexus injury.

April 2009 to March 2010, Annual Report

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1. Introduction

The Children's Brachial Plexus Service has continued to be busy with more patients referred. More surgical procedures have been required than last year. A newly appointed Consultant Plastic Surgeon has contributed to the service during the year adding to range of interventions available.

2. Statement of Activity

	<u>Actual</u>	<u>Agreed</u>
Assessment	38	
Tertiary new outpatient referrals	25	
Admission for surgery	2 nerve, 5 shoulder	7
ITU bed days		
HDU bed days	2	
Total ward bed days	34	
Outpatient follow up appointments	187	
NHS Board of residence for referrals:		
Fife		1
Forth Valley		2
Grampian		4
Greater Glasgow & Clyde		19
<i>GGHB& Clyde tertiary</i>		6
Highland		2
Lanarkshire		5
Lothian		4
Tayside		1
		<u>25</u>
Total tertiary referrals		

There is a preponderance of referrals from Greater Glasgow and Clyde which reflects the fact that we are the primary referral centre for this area and are asked to see all cases, no matter how minor. Referrals from other areas are as recommended in our guidelines and represent the more severe cases. Therefore the referrals from Greater Glasgow and Clyde (19 cases) were divided into primary-type referrals (arbitrarily defined as cases discharged after 3 or less clinic visits = 13 cases) and true tertiary-type referrals (6 cases).

The number of ward bed days was affected by one child with a traumatic brachial plexus injury who required admission for 13 days.

NHS Board of residence for admissions:	Greater Glasgow & Clyde	2
	Grampian	1
	Highland	1
	Lanarkshire	1
	Lothian	<u>2</u>
		7

NHS Board of residence for follow-up outpatient appointments:	Ayrshire and Arran	5
	Borders	3
	Dumfries and Galloway	6
	Fife	13
	Forth Valley	7
	Greater Glasgow & Clyde	84
	Grampian	6
	Highland	5
	Lanarkshire	34
	Lothian	22
	Tayside	<u>2</u>
	<u>187</u>	

3. Analysis of Trends, Demand and Referral Patterns

Referrals

The number of referrals to the service has remained similar compared with previous years.

Surgery

The number of surgical procedures performed is similar to that during 2009-9. Most interventions are for shoulder deformity and late reconstruction for obstetric brachial plexus palsy. One older child required nerve exploration and repair for a serious traumatic brachial plexus injury.

Outreach Clinics

In order to assess and follow-up patients from the North East of Scotland clinics were held at Woodend Hospital, Aberdeen in September 2009 and March 2010. 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.

Occupational Therapy

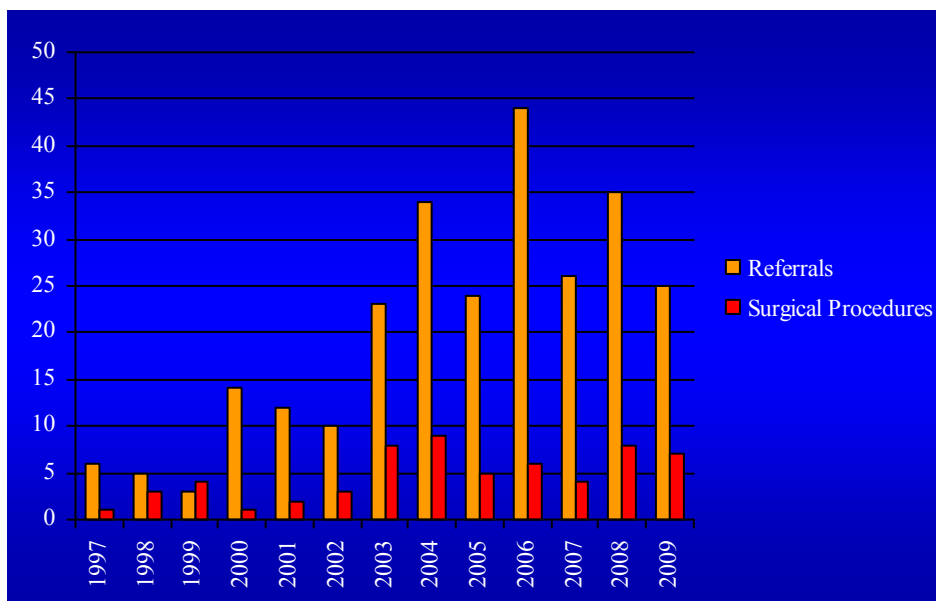
Some children have been referred to the Occupational Therapy Department at Yorkhill for assessment of the wider impact of their upper limb condition on their development. Approximately 23 children from the Greater Glasgow and Clyde area with OBPP have been seen in occupational therapy taking at least 2 hours per child.

Referrals and Operation Numbers since 1997:

Year	Referrals	Surgical Procedures
1997	6	1
1998	5	3
1999	3	0
2000	14	1
2001	12	2
2002*	10	3
2003	23	8
2004	34	9
2005	24	5
2006 – 07	44	6
<i>2007- 08</i>	<i>39</i>	<i>4</i>
2007-08 (ter)	26	4
<i>2008 – 09</i>	<i>40</i>	<i>8</i>
2008- 09 (ter)	36	8
<i>2009 - 10</i>	<i>38</i>	<i>7</i>
2009-10 (ter)	25	7
Total		57

*specialist clinic started.

Activity Graph



4. Response Times

The time between referral and a clinic appointment ranged from 10 to 68 days – average 34 days. Many children are seen by one of the specialist physiotherapists, for advice on exercises, before coming to the out-patient clinic. The urgency of the referral is graded when it is received. The response times have been appropriate to the condition of the patients.

5. Quality and Accreditation

Clinic Information Leaflet

An information leaflet has been produced for patients attending the Obstetric Brachial Plexus clinic. Additional leaflets from the (British) Erb's Palsy Group are provided where appropriate.

Referral Guidelines

Referral guidelines are available on the website www.brachialplexus.scot.nhs.uk

6. Audit Measures including Future Developments

Age of children when first seen in the OBPP clinic

We have looked at the age of children when first seen at the OBPP clinic. This gives a measure of the effectiveness of our referral guidelines. The table below shows the age in days when children were first seen during different years. The data is affected by the referral of some older children for reassessment. The median age when first seen is therefore the most indicative measure. Overall it is evident that during the last 5 years children have been referred and assessed earlier with most being seen by the age of 4 months. This is a sufficiently early age to be considered for all possible interventions.

Years:	Until 2002	2002-05	2005-08	2008-present
Mean:	717	1025	780	1098
Median:	424	170	79	125
Maximum:	4070	6526	6866	6468
Minimum:	2	30	13	15

Outcome of Shoulder Surgery

The initial injury is classified using Narakas groups. Outcomes are recorded in terms of recovery of muscle groups in the upper limb with regard to shoulder, elbow and hand function. In addition to recording recovery of the various muscle groups we use the following scoring systems:-

1. **The Mallet score.** This measures shoulder function.
2. **A record of active and passive movements of the shoulder and elbow with details of any joint contractures**

These form part of ongoing audit of the performance of the service. The most recent data is presented in the table below. The improvements in external rotation of the shoulder and the Mallet score are similar to those in other published series.

Table: Upper limb movements before operation and at last follow-up in 25 children undergoing soft tissue rebalancing to restore external rotation of the gleno-humeral joint between 2002 and 2008.

	Mean (SD) values before operation	Mean values (+/- SD) at last follow- up	Difference	P value
Active flexion	117° (38)	122° (44)	5°	0.4
Passive flexion	168° (12)	158° (22)	(-10°)	0.09
Active abduction	111° (38)	118° (52)	7°	0.4
Passive abduction	165° (17)	159° (31)	(-6°)	0.3
Active inferior GH angle	107° (33)	104° (43)	-3°	0.7
Passive inferior GH angle	143° (13)	144° (26)	-1°	0.9
Passive posterior GH angle	56° (12)	59° (13)	3°	0.4
Opposite posterior GH angle	76° (8)	77° (12)	1°	0.6
Active External Rotation	(-21°) (26)	32° (17)	53°	<0.000001
Passive External Rotation	26° (26)	67° (12)	41°	0.000001
Mallet score for active Internal Rotation	2.9 points	2.5 points	-0.4 points	
Active pronation	61° (27)	61° (20)	0°	0.9
Passive pronation	80° (17)	83° (15)	3°	0.2
Active supination	48° (32)	61° (29)	13°	0.1
Passive supination	84° (11)	85° (11)	1°	0.7
Mallet score	12.8 points	17.5 points	4.7 points	0.00002

GH angle – gleno-humeral angle

7. Teaching and Research Activities

Lectures delivered in 2009/10

David Sherlock

23rd October 2009

Scottish OBPP service and our preferred treatment protocols.

Combined meeting of the Scottish Paediatric Orthopaedic Club and the Swedish Paediatric Orthopaedic Society. Edinburgh.

10th December 2009

Scottish OBPP service and our preferred treatment protocols.
MCh Orthopaedics Course, Ninewells Hospital, Dundee.

Tim Hems

April 2009

Edinburgh Hand Surgery Course
Management of Brachial Plexus Injuries (TEH).

October 2009

National Centre for Training and Education in Prosthetics and Orthotics. BA students.
"Role of Surgery in Management of Brachial Plexus Injury".

Claire Murnaghan

25th Nov 2009

Neonatal Brachial Plexus Palsy: History of the Injury and Current Aims of Management.
Southbank Child Development Centre, Glasgow.

Andy Hart

1. "Optimising the outcome of nerve repair: Present & future." Combined meeting of the British & American Societies for Surgery of the Hand, London, May 2009. Invited Speaker.
2. "Free functional muscle flaps for reanimation of the upper limb." Hart AM. British Society of Hand therapists (BAHT), July 2009.
3. "Addressing neurobiology to enhance the outcome of nerve repair." Hart A, British Association of Hand Therapists, Annual Meeting, 2009.
4. "Functional muscle transfer in the secondary reconstruction of brachial plexus injury." Hart A, Scottish Association of Hand Therapists, Annual Meeting, 2009.
5. "Management of Obstetric Brachial Plexus Palsy", Princess Royal Maternity Hospital, Glasgow. February 2010.

Research Activity

Work is in progress aimed at publishing the unit policy and results for shoulder reconstruction in children with OBPP.

New Research Activity

A study is being planned to formally measure elbow flexion strength in children who have had OBPP. Although useful active elbow flexion is regained in most children, the strength has not been quantified in detail in the past.

We are also analysing the progression of recovery of shoulder and elbow movement to see if the outcome for shoulder recovery can be predicted at an early stage, therefore aiding the selection of patients for additional surgical reconstruction.

Mr Hart

Postgraduate Research Activity:

Mr Hart is academic lead for plastic & reconstructive surgery in the developing School of Surgery within the University of Glasgow. There is a particular emphasis on nerve reconstruction.

Principal supervision of doctoral research:

- Mr Hart is principal investigator on a £200,000 grant from the Stephen Forrest Trust investigating the creation of a nano-patterned construct with integral solenoid activity for nerve reconstruction. Two PhD students are employed [CW & TD], one biomedical and one electronic engineer, working in collaboration to develop the construct. Project commenced September 2009, with co-supervision by Dr. Mathis Riehle & Prof. David Cummings of the University of Glasgow.

Assistant supervision of doctoral research:

- PhD thesis (CW) investigating the dose-response effect of N-acetyl-cysteine as a neuroprotective agent after peripheral nerve repair, plus the role of volumetric MRI as a non-invasive proxy measure of neuronal death. This study involved animal & clinical trials. Studies are complete. Clinical proof of concept study comparing cadaveric dissection study with volumetric MRI of normal volunteers complete, and in first draft. Further clinical study assessing upper limb amputees, and median/ulnar nerve injury patients undergoing data analysis. I have assisted the supervision provided by Prof. Wiberg. Interrim defense completed, PHD defense schedule for 2011.
- Mr Hart assisted the supervision, by Prof. Kay of the Childrens Hand Clinic, Leeds, of a surgical trainee (RP) investigating the role of free tissue transfer in patients under two years of age, and of a large series of free functional muscle flap biceps reconstructions. Findings presented internationally, and papers published 2009.

8. Financial Report

Sent separately.

9. Service Developments and Future Plans

New Consultant Paediatric Orthopaedic Surgeon

Claire Murnaghan was appointed as Consultant Orthopaedic Surgeon at the Royal Hospital for Sick Children, Yorkhill, Glasgow in August 2009 in preparation to replace David Sherlock who retired in November 2009.

Claire undertook Basic Surgical Training and then Higher Surgical Training in Trauma and Orthopaedics in the West of Scotland and successfully obtained FRCS (Trauma and Orthopaedics) in 2007.

She was awarded a 1 year National fellowship in Paediatric Orthopaedic Surgery based between Great Ormond Street Hospital for Children and the Royal National Orthopaedic Hospital, Stanmore from 2008-2009. During the attachment to the Catterall unit at Stanmore, she also took the opportunity to attend clinics at the Peripheral nerve Injury Unit, seeing children and adults with a host of problems, including brachial plexus injuries.

After starting the Consultant post has been able to visit the Texas Scottish Rite Hospital in Dallas (USA), participating in a practical course for Orthopaedic surgeons who specialise in neonatal brachial plexus injury, run by Dr Mary-Beth Ezaki, who is a world expert on the subject. Here, she was trained in ultrasound imaging of shoulders in children with brachial plexus lesions. This modality is a simple, reliable means of imaging shoulders in infants without exposing them to radiation (X-rays are notoriously difficult to interpret in this age-group) and can identify those children who have shoulders "at risk" of subluxation or dislocation. She was then instructed on the further management of such cases, by means of closed reduction of the shoulders and injection of botulinum toxin into specific muscles, thereby reducing the need for more extensive operations at a later date.

At the end of 2009 Claire attended a seminar on neonatal brachial plexus injury at the International Paediatric Orthopaedic Symposium in Florida, with the faculty including Dr Peter Waters, Dr Scott Kozin, and Dr Ezaki.

Claire believes communication between our specialist unit and the community is essential in order to ensure that we continue to receive referrals and support from the community teams in each region.

Future Developments

1. Ultrasound for Shoulder Assessment

Claire Murnaghan is now introducing the use of Ultrasound for assessment of the shoulder in children with OBPP at Yorkhill. This technique is applicable to children under 1 year of age. If dislocation or subluxation of the shoulder is identified early then closed reduction may be possible. Even if open surgery is needed the results appear to be better the younger this is performed.

This development is particularly relevant as the referral patterns built up over the last decade now mean that most children are assessed by the age of 4 months (See section 6).

2. Website

Due to the success of the web site we have started work on new site. The new site will have resources for all Health Professionals who care for brachial plexus injured patients. We have re-designed the home page to include referral guidelines and means of referral, hopefully making referral to the Service even easier.

10. Summary and Conclusions

In November 2009 David Sherlock retired from the Royal Hospital for Sick Children. He continues to undertake adult Orthopaedic Surgery at the Southern General Hospital.

David had an interest in the management of OBPP which he developed during the 1990s and formed the basis for starting the specialist clinic in 2001, then designation of a National Service in 2006. We thank him for his contribution to the development of the service.

We are pleased to welcome Claire Murnaghan to the service. The new skills she has brought will enable a wider range of treatment options to be offered to patients in the future.

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 long cases. The management of Yorkhill Hospital has given help and support to the service particularly in enabling Claire Murnaghan before David Sherlock's retirement thereby facilitating a smooth transition.

Appendices

I. Physiotherapy Service

Supervised by Jean Eadie, Consultant Musculoskeletal Physiotherapist.

Erb's Palsy Physiotherapy Guidelines

- Babies born in the two maternity units in Glasgow are seen within two weeks.
- Seen as in-patients pre & post operative surgery when appropriate.
- Follow up as out-patients as required.
- On-going treatment as necessary.
- Physiotherapist attends clinics to assess and measure joint mobility and muscle power.
- Lecturing at areas within the city and outlying areas.
- Advice given by e-mail, telephone etc.
- Acting at a consultative level.

II. Administrative Support

There is full time administrative support for the Brachial Plexus Team. This allows for prompt data collection, up to date patient information and helps smooth the referral process. We have a database that contains all the Service and clinical information on our patients.

Over the past year we have created a more in-depth website (www.brachialplexus.scot.nhs.uk). We have split the site into different sections to make it easier for users to target the areas most relevant. We have also made contact details more accessible as well as telling the user a bit about the Service. There are clear links to referral guidelines and modes of referral.

III. Clinical Neurophysiology and Radiology

Neurophysiology investigations are provided by the Drs Ian Horrocks and Rob McWilliam, Paediatric Neurologists, both for outpatients and during surgical procedures. Magnetic Resonance Imaging (MRI) is performed when necessary. Their ability to offer timeous investigations provides essential support for the service and is greatly appreciated.

Tim Hems,
Consultant Hand and Orthopaedic Surgeon, Lead Clinician.