# Rehabilitation of the Upper Limb Amputee :Considerations and Challenges BAPO, 17 March 2018

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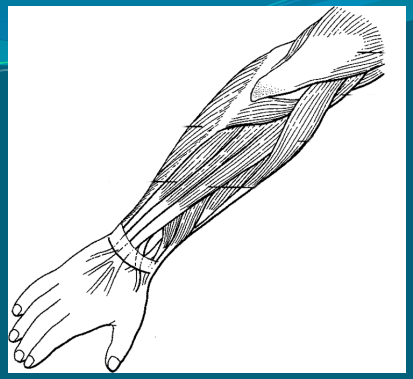
# Introduction



- The upper limb is incredibly complex
- Upper limb amputee rehabilitation is complex (physically and psychologically)
- Very different client group to lower limb
- Prosthesis is not always the answer
- Need for flexible and creative thinking
- OT may be able to offer alternative solutions
- Team members may approach problems different perspective

# The Upper Limb Team

- Doctor
- Prosthetist
- Occupational Therapist
- Psychologist
- Physiotherapist
- Clinical Nurse Specialist
- Social Worker
- Technicians

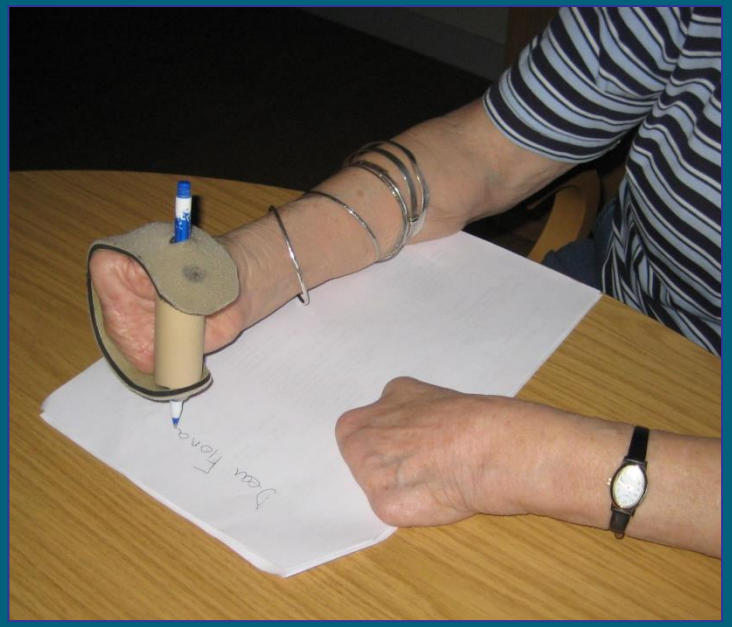
# Digit Amputation

- Finger / finger tip amputation can have significant psychological impact
- Some patients report functional difficulties which are disproportionate to level of injury
- Involve psychology/ counselling services prior to prosthetic prescription, where possible
- Trial finger from PVC glove
- High definition Silicone- specific process/ criteria – HDS not always the answer.
- OT can assess function and suggest strategies and/or adaptive aids as required
- Offer peer support

# Partial hands

- Complex from prosthetic perspective – limited options
- Patient may be more functional without prosthesis
- RPL semi-custom gloves can work well for cosmesis
- Alternative options (for function) include:
  - Bespoke devices – not CE marked!
  - Opposition plates
  - Cutlery cuff straps
  - Active Hands
  - Peer Support

# Partial Hands



# Bi-laterals – Considerations

- Consider shortening one of the forearms to enable patient to bring terminal device to their mouth.
- Prostheses are only part of the solution.
- Additional aids/ adaptations to maintain independence.
- Consider Environmental controls
- Peer support ++
- Prioritised Goal setting is crucial
- Each activity may require combination of options

# Bi-laterals Toileting Options

- Closomat/ bidet toilet
- Telescopic dressing stick
- Prostheses
- Bottom wiper device
- Paper on seat or heel
- Wet wipes
- Wall hook/ dressing tree
- Carer assistance

# Prosthetic Selection Process

- Goal setting – to direct prescription. What for and why? Be specific
- Protocols/ criteria for different types of prosthesis, e.g. single amputees must have tried body powered or cosmetic before myo- electric considered and demonstrate commitment
- Physiological and psychological factors
- Less clear cut with bi-lateral and multiple amputees – case by case approach

# Prosthetic Selection – the OT role

- Goal Setting - Self care, productivity and leisure
- Activity analysis - simulate specific parts of a task.
- Liaison with other centres
- It's not all about the prosthesis. Alternative options include; compensatory techniques, adaptive equipment, external organisations.
- Knowledge of what other agencies exist - avoid reinventing the wheel, e.g. OHMI, LEPMIS, Alice Reigns

# Prosthetic Prescription - Children

- Specific age ranges at which we will consider different types of prosthesis.
- Start with cosmetic (from 6 months)
- If family demonstrate commitment, consider body powered from 2 years and Myo, from 4 years.
- Family and child to identify appropriate goals before new or alternative prescription is considered.
- Activity Limbs - either bespoke device or using sports funding.
- Review annually

# Myo-electric protocol

- Joint MDT decision
- Established/ regular limb wearer (minimum six months)  except bi-lateral upper limb amputees
- Tolerate the weight of a myo-electric prosthesis
- Sufficient muscle signals
- Suitable shape and length of  stump
- Current prescription does not meet their clinical need or functionality level
- And/ or Psychosocial need
- Goal setting with OT  to establish specific goals that cannot be achieved  using an alternative prosthesis
- Cognitive capacity
- Commit to a minimum of three training sessions prior to prescription of a myo-electric prosthesis with three further training sessions at delivery and post delivery.
- The patient will then be reviewed after three months, six months and one year.
- The Occupational Therapist will guide the patient to transfer the use of the prosthesis to home school and work.
- The patient must agree to abide by manufacturers instructions e.g. avoid contact with water, grease, solvents etc.
- Patients must agree to return the prosthesis if they are not finding it beneficial.
- N.B. with regards to children the OT would need to be in contact with the child's school/ nursery and ideally conduct a school visit.

# Training – Adults

- Pre-prosthetic training using PAULA (Myo-electric only)

Post Delivery:

- Donning/ doffing practice and learning mechanisms
- Repetitive drills
- One handed tasks
- Two handed tasks based on identified goals – start simple and increase complexity
- Short/ regular training sessions to start, gradually increase wear time
- ?? Bi-annual Reviews!

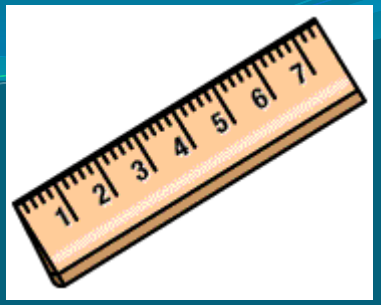
# Training - Children

- Pre-prosthetic training using PAULA (Myo-electric only)

Post Delivery:

- Teach donning/ doffing to parents and child
- Teach mechanisms to parents and child
- Repetitive drills
- Games – one handed
- Two handed (age appropriate) tasks based on identified goals e.g. rice treats
- Similar to adults – make it fun!!

# Outcome measures




- Outcome measure development has not kept pace with prosthetic advances (Biddis and Chau, 2007)
- Outcome Measures –we currently use;
  - Canadian Occupational; Performance Measure (COPM)
  - Tapes – Trinity Amputation and Prosthesis Experience Scales - Revised
  - Assessment of Capacity for Myoelectric Control
  - Box and Blocks Assessment
  - History of Anxiety and Depression (HAD)

# Myo-electric rejection


- Inconsistencies in the available date regarding myoelectric rejection rates which ranged between 8 and 50%. (Edeer and Martin, 2011)
- Generally agreed that rejection rates are high, particularly among children
- Developed prescription protocol to help reduce this
- The current protocol at QMH needs work with regards to bi-lateral/ multiple limb amputees
- Where possible, offer trial of myo-electric hand prior to prescription, in order to reduce rejection rates

# Use and care of remaining limb

- Independence with activities of daily living: one - handed techniques
- Education on preventing overuse of remaining limb – choice of clothing, ergonomic equipment, alternative techniques
- Advice on joint protection and energy conservation
- Postural education e.g. ergonomic workstation
- Liaison with school/ work as appropriate
- Prescription of/ advice on appropriate adaptive aids and assistive devices

# Compensation strategies

- Combination of techniques and assistive devices
- Strategies used will depend on the patient, level of amputation, general mobility, co-existing difficulties
- Examples: writing, tying shoelaces, opening jars, peeling vegetables
- Simplest solutions are often best

# Tools for home and school

- Adapted scissors
- Paper holder
- Adapted cutlery e.g knork
- Right angled knife
- Dycem – non-slip material


# Case Study 1

- 12 year old girl
- Congenital below elbow
- Moderate learning disability, attends special needs school
- Requested myo-electric prosthesis
- Assessed to be unsuitable for myo-electric at another centre, 2 years previously

# Case Study 1 - Approach

- MDT assessment – Doctor, OT, prosthetist and psychologist
- Consult myo-electic protocol
- Assessment using PAULA
- Goal setting
- MDT discussion
- Patient met criteria, team agreed to proceed to myo-electric trial

# Case Study 1 -Training

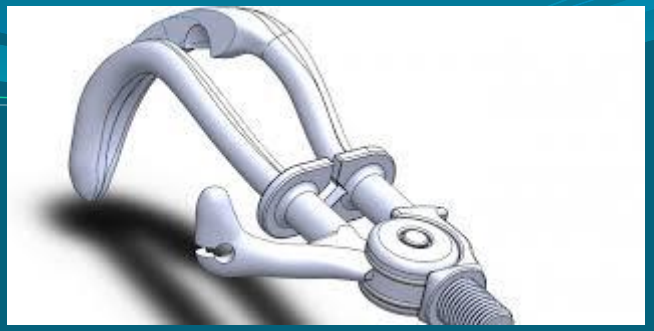
Pre Prosthetic

- PAULA – Car game +++

Post delivery

- Picking up blocks
- Bee game
- Egg and spoon race
- Fishing game
- Rice crispy cakes
- Patient became engaged in the activities and soon forgot about weight

# Case Study 2



- Female, 38 years. Below Elbow amputation following RTA and Brachial Plexus injury
- Reconstruction to the elbow resulting in active but limited elbow flexion
- Tried split hook but patient unable to extend elbow without crossing midline

# Case Study 2

- Voluntary closing pre-hensor with cutaneous suspension
- Result = Improved function, increased scores on outcome measures, increased endurance
- Improved posture, reduced abnormal movement
- Reports using in daily activities such as food preparation

# Case Study 3

- 13 year old
- Ischaemic amputation, LT wrist disarticulation
- 4 limb motor disorder (CP) right side weaker than left
- Left side dominant – very limited function in right hand
- Global developmental delay
- Prescribed split hook in 2014, Initially managed well but lost motivation
- Elected to revisit prosthetics in 2017
- Goals: to hold microphone and manipulate building blocks.

# Case Study 3

- Prescribed voluntary closing TRS hand

<u>Training Strategy</u>

- Physical and verbal prompting
- Repetition ++
- Consistency with phrases
- Hands on facilitation
- Use of games and play activities for motivation
- Allowing sufficient time for sessions
- Allowing for multiple training sessions
- Knowing when to stop – patient choice

# Case Study 3 - Outcome

- Team underestimated the complexity of the process for this patient
- This device was deemed unsuitable for this patient due to involuntary movements associated with cerebral palsy
- Offered coloured hook but patient declined
- Next step: Trial with voluntary opening hand

# Case Study 4

- Female 48 years. Amputation of 4 limbs due to sepsis
- Bi-lateral below elbow amputations
- Initially opposed to body powered prosthesis due to appearance
- Requested myo-electric,  with electric wrist rotator
- Commenced myo-trail using PAULA - no improvement during training sessions
- Struggled to tolerate weight
- Introduced to another patient with similar levels of amputation

# Case Study 4 - Outcome

- Patient agreed to try carbon fibre gripper
- Terminated myo-electric trail and commenced training with gripper
- Still very early days but patient currently using well.
- Able to take prosthesis home when discharged from the ward.
- Able to play games with daughter – return to previous role.

# Final thoughts

- Not all upper limb amputees will opt to wear a prosthesis
- What works for one may not work for another – team must remain flexible and communicate effectively.
- Unique, client centred approach
- Consider the appropriate time for prosthesis – may not be immediately post amputation – grief process
- Multi Disciplinary Team approach
- Trial and error – (we don't always get it right first time/ have all the answers)
- Prosthetic arm is not a replacement limb but a tool
- Sharing of ideas between centres is invaluable

# Useful Resources

- OHMI – One handed musical instrument society
- LEPMIS – adaptive gaming
- Special Effect – adaptive gaming charity
- REACH – association for arm or hand deficiency
- REMAP – voluntary engineers specialising in bespoke devices.

OHMI
Enabling Music-Making for the Physically Disabled

game access
by LEPMIS

# References


- Biddiss, E. and Chau, T. (2007). Upper limb prosthesis use and abandonment: A survey of the last 25 years. Prosthetics and Orthotics International, 31(3), pp.236-257.

- Edeer, D. and Martin, C. (2011) *Upper Limb Prostheses – a review of the literature with a focus on myoelectric hands.* Available at: http://www.worksafebc.com/health_care_providers/Assets/PDF/UpperLimbProstheses2011.pdf (Accessed: 5 October 2014).

# Thank you for listening