Management of Spasticity

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Spasticity Service in Newcastle

- 19 years
- Multidisciplinary – nurse/physiotherapist/orthotist and physician (neurologist and rehabilitation physician) – able to access neurosurgeon
- 2 clinics per week – about 60 people each week with around 750 people attending 4 times per year
- Mainly stroke and MS, plus TBI, CP, etc.
- Adults and children – range 1 – 98 years

How many could benefit?

- No hard data
- MS – around 50% need spasticity treatment
- TBI – around 65%
- Stroke – around 25-30%

Spasticity

Why treat?

- Improve function
- Prevent complications
- Alleviate pain
- Ease nursing

Outcome assessment

- Base on Activity measure
  - Hand function
  - 10m walking time
  - Pain VAS
- Patient-reported outcome
  - VAS / NRS
- Should we bother with impairment at all?

Modified Ashworth Scale

0 No increase in tone

1 Slight increase in tone, manifested by catch and release, or by minimal resistance at end of range of motion

1+ Slight increase in tone, manifested by catch and minimal resistance throughout remainder of ROM

2 More marked increase in tone throughout most of ROM, but affected part easily moved

3 Considerable increase in tone, passive movement difficult

4 Affected part rigid in flexion or extension

Spasticity Management

- None
- External factors
- Seating/Positioning
- Physiotherapy

Physiotherapy techniques

- Forced use training (Taub 1993)
- Treadmill training (Hesse 1996/7/8/9)
- Repetitive training (Platz 2001)
- Music therapy (Thaut 1997)
- Mirror usage (Altschuler 1999)
- Motor imagery (Page 2001)
- EMG triggered electrical stimulation (Fields 1987)

Seating

Splinting

Casting

Orthoses

Oral Medication
When to use?

- Mild spasticity – need any medication?
- Severe spasticity – medication likely to be unhelpful – consider focal treatments
- Moderate spasticity – most likely scenario
- Balance between benefit and side effects

Comparative Evidence – MS / SCI

- Shakespeare et al – Cochrane 2003
- Taricco et al – Cochrane 2005
- Baclofen v Placebo
  - Total 8 studies
  - Evidence of efficacy against placebo
  - With or without stretching exercises
  - Some evidence of efficacy in spasms and clonus

Comparative Evidence

- Dantrolene v placebo
  - 3 studies
  - No conclusions!

Comparative Evidence

- Tizanidine v Placebo
  - 3 studies
  - Some, limited, evidence of efficacy after data manipulation

Comparative Evidence

- Vigabatrin v Placebo
  - 2 studies – one positive and one negative
- Clonidine v Placebo
  - 1 study – 5/9 improved in active phase
- Gabapentin v Placebo
  - 3 studies – positive
- L-Threonine v Placebo and Prazepam v Placebo
  - 1 study each – equivocal results

Head-to-Head Evidence

- Baclofen v Tizanidine – 7 studies
  - Little difference in anti-spastic effect
  - Baclofen seems to cause more weakness
- Diazepam v baclofen, tizanidine and dantrolene (1 each)
  - Diazepam causes more sedation but equal anti-spastic effects

Gabapentin

- Gruenthal et al, 1997
- 25 people with SCI on double-blind, placebo-controlled study
- 2400mg gabapentin over 48 hours
- Statistically significant improvement in Ashworth and patient reported Likert scale

New Medication

- Gabapentin
- Pregabalin (Lyrica)
- Cannabis

New Medication Cannabis

- Cannabinoid receptors in CNS and PNS
- CB1 (neurones) and CB2 (immune cells)
- Natural CB1 receptor agonists identified
- Natural function in man unclear
  - Antiemetic
  - Appetite stimulants
  - Analgesic
  - Management of glaucoma and asthma
  - Anti spastic

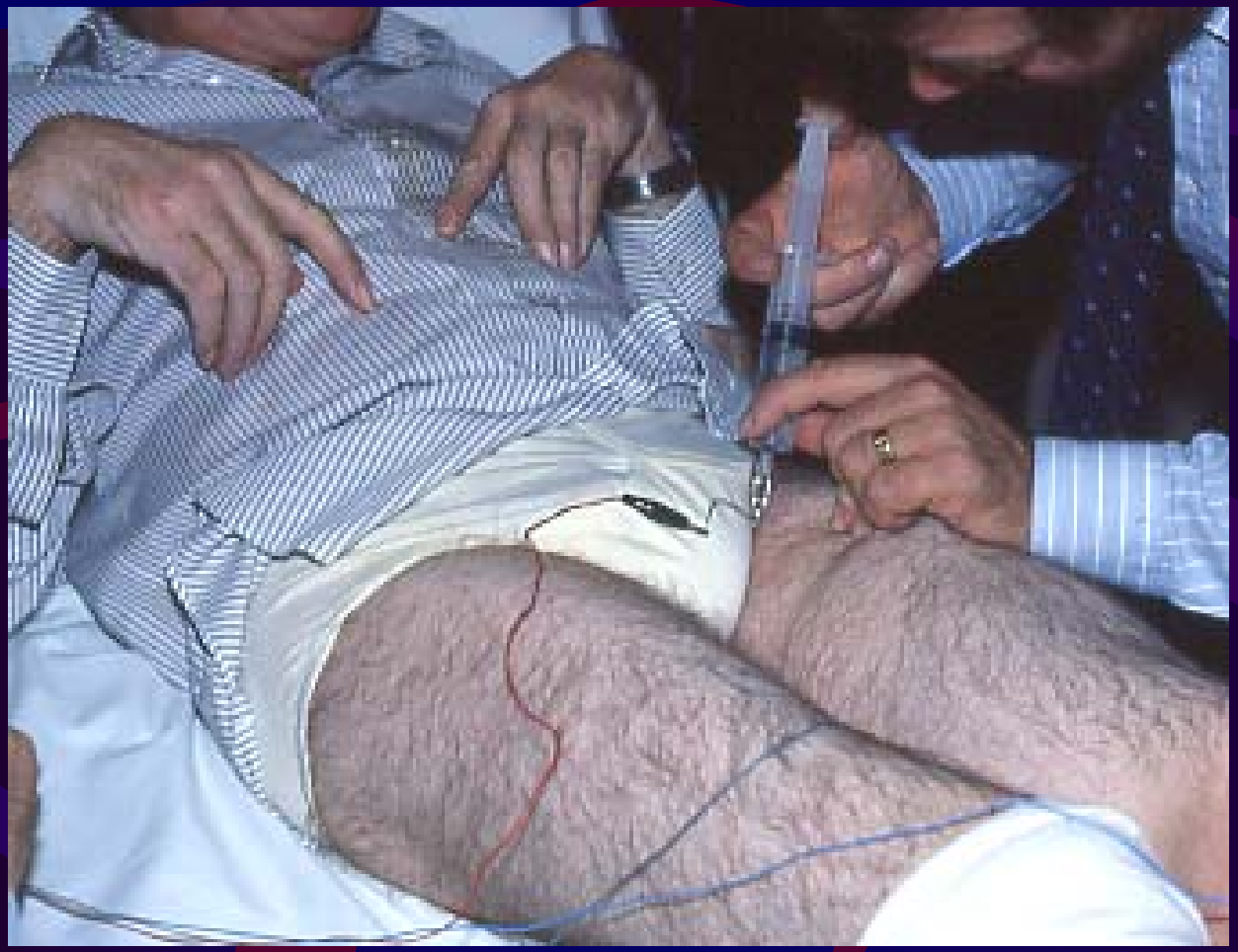
Cannabis

- Recent UK trial evidence confirms efficacy in otherwise resistant MS spasticity
- Sativex (a blend of equal proportions of delta - 9 - tetrahydrocannabinol and cannabidiol, produced as nasal spray by GW Pharma) now licensed in Canada. Available in UK as unlicensed product.

Nerve Blocks

- Phenol or alcohol
- 2-6mls of 3-6% phenol
- Any accessible nerve but good results from obturator and posterior tibial injections
- Dysaesthesiae can be a problem

Phenol Injection



Spasticity Management

- Reduce external factors
- Physiotherapy
- Oral medication
- Nerve blocks
- Botulinum toxin

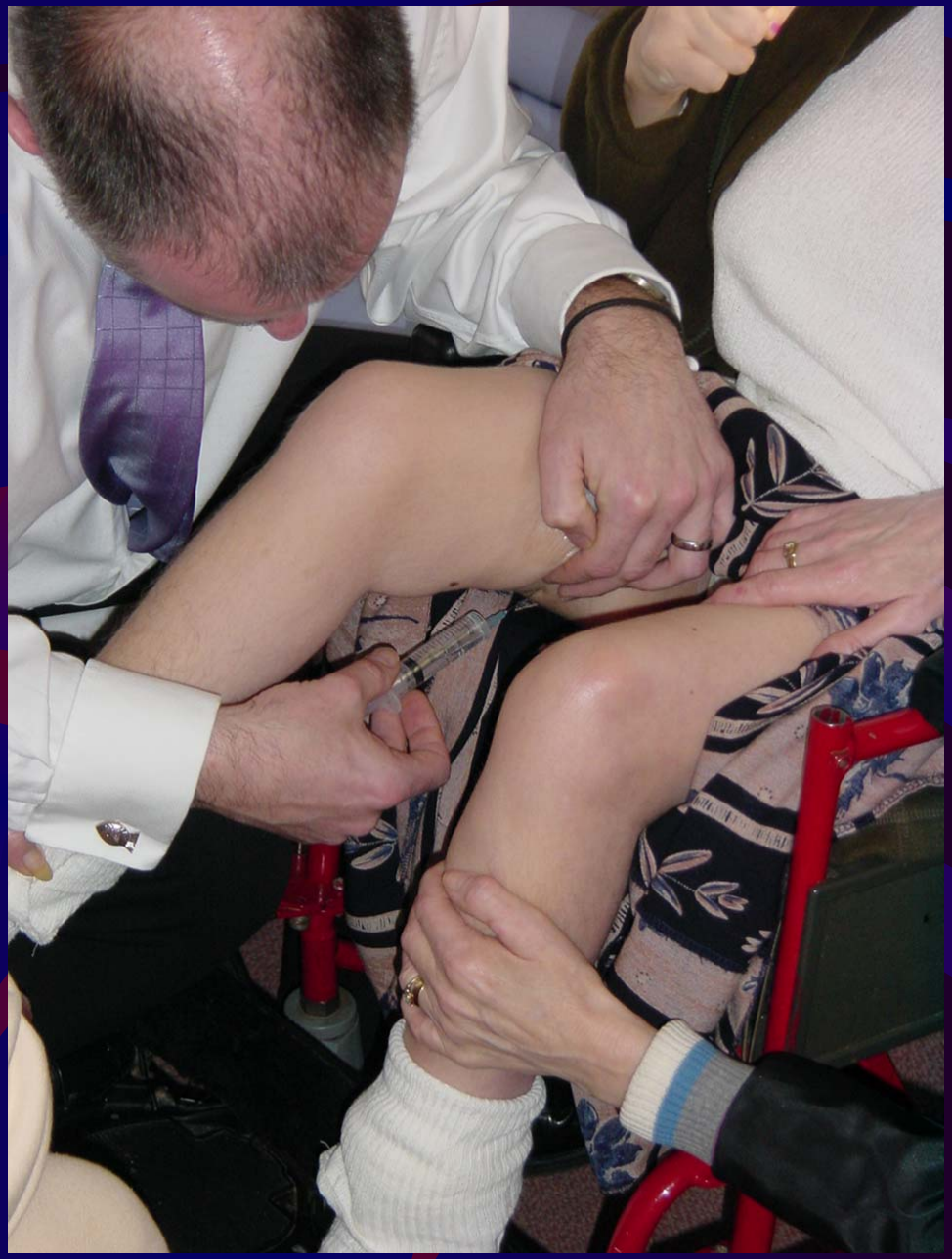
Botulinum Toxin

- Seven serotypes – A,B,C,D,E,F,G
- Type A currently available – Dysport and Botox
- New Type A (Xeomin) available in Germany – free of complexing proteins
- Type B – Neurobloc – released in March 2001 (Europe and USA)
- Other serotypes probably too short acting

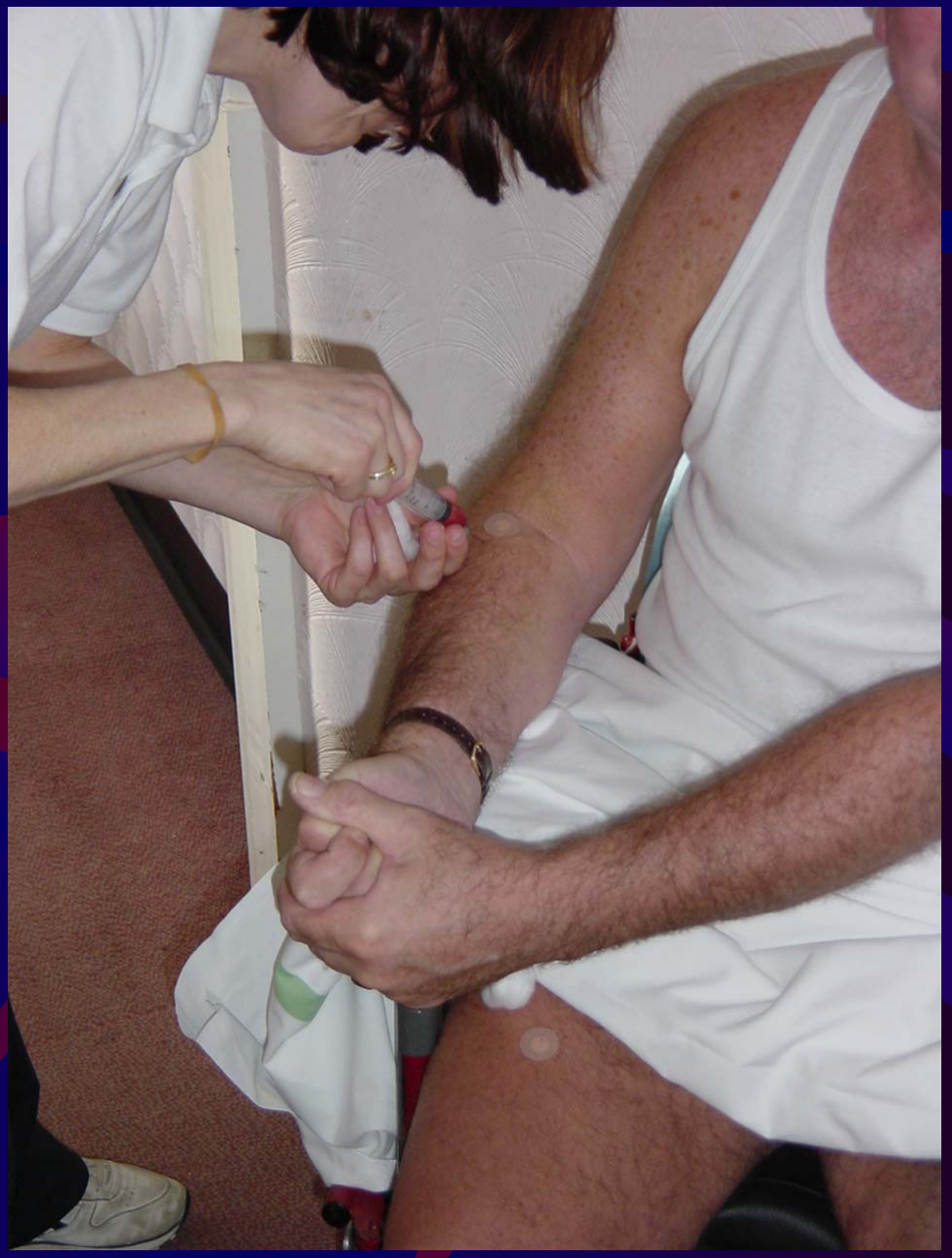
Technique

- Clinically identify overactive muscle
- Inject into muscle
- Some spread possible to nearby muscles
- Takes 2/4 days to “kick in”
- Lasts 2/3 months
- Combine with other treatments, especially physiotherapy

Technique



Technique



Evidence

- Richardson et al, JNNP 2000;69:499
  - 52 adults; stroke,TBI,spinal injury,tumour,CP
  - Prospective, randomised, double-blind, placebo controlled, parallel group trial
  - Summed scores for Ashworth, passive ROM, Rivermead lower limb and subjective rating
  - Significantly better in treated group compared to placebo up to 12 weeks

Evidence - Arm

- Brashear et al, N Engl J Med 2002
  - Randomised, double-blind placebo-controlled trial in 126 people post-stroke
  - 200-240 units Botox into wrist/finger flexors
  - Selected one of hygiene/dressing/pain/limb position on 4 point scale
  - Significant improvement up to 12 weeks
  - No significant side effects

Evidence – Associated reactions

- Bakheit et al, Disabil Rehabil 2002
  - ARs in about 80% after stroke
  - 500 Dysport into paretic biceps – open pilot
  - Significant reduction of ARs and 7/8 said walking better – but balance/mobility not improved

Evidence - toes

- Supittitada, Am J Phys Med Rehabil 2002
  - 20 post-stroke with hitchhikers great toe or toe flexor spasms – open study
  - Up to 95 units (?Botox) into long flexors
  - Ashworth, pain VAS and functional VAS all improved – up to 6 months

Evidence - shoulders

- Yelnik et al, Eur Neurol 2003
  - 3 people post stroke
  - Open study
  - 250 units Dysport into subscapularis (EMG)
  - Improved pain and ROM

Evidence – Type B

- Brashear et al, Arch Phys Med Rehabil 2004
  - Double-blind, placebo-controlled trial
  - Post-stroke arm spasticity
  - 10000 units Myobloc
  - Ashworth reduced in BTX-B at week 2 only at wrist – not at other joints
  - Physician GAC not significant
  - Troublesome side effects (dry mouth)

Evidence – long term

- Gordon et al, Neurology 2004
  - Repeat treatments up to 42 weeks continued to show improvements in post-stroke, placebo controlled study
- Bakheit et al, JNNP 2004
  - Post-stroke arm (open)
  - 1000 units Dysport efficacious up to 3 treatments

Botulinum plus

- Frasson et al, Mov Disord 2005
  - Low frequency NS (4Hz) produced greater reduction of CMAP in EDB after BTX injection compared to no stimulation or high frequency stimulation (25Hz)
- Johnson et al, Arch Phys Med Rehabil 2004
  - Increased walking speed with stimulation (daily for 16 weeks) compared to no stimulation (gastroc/tib post) after single BTX injection

Botulinum plus

- Constraint therapy plus BTX? (Page et al, Am J Phys Med Rehabil 2003)
- OT plus BTX better than OT alone. (Arm function in CP children). Fehlings et al, J Pediatr 2000

Botulinum plus

- Casting plus BTX is better than BTX alone
  - Bottos et al, Dev Med Child Neurol 2003
  - Kay et al, J Bone Joint Surg Am 2004
  - Ackman et al, Dev Med Child Neurol 2005
  - Verplancke et al, Clin Rehabil 2005

Economics

- Ward et al, J Rehabil Med 2005
  - Cost-per-successfully-treated-month was £947 / £1387 / £1697 for BTX 1st line / BTX 2nd line / oral therapy
  - 35% response on oral therapy compared to 73% and 68% for BTX 1st / 2nd line therapy

Disadvantages

- Antibodies/secondary failure
- Repeat injections / cost
- Logistics

Botulinum conclusions

- Does BTX-A work in short term?
  - yes, for all ages and for all muscle groups tested
- Does BTX-A work in longer term?
  - yes
- Does BTX-B work?
  - probably not as well as A

Botulinum conclusions

- Does it work better with something else?
  - Yes, at least with casting and probably nerve stimulation
- What is the optimum dose?
  - Not clear, depends on muscles injected – no definite protocol seems possible or desirable
- What is the best dilution?
  - Higher than previously thought?

Intrathecal Baclofen

- Subcutaneous implantable pump connected to intrathecal catheter
- Pump is programmable
- Effective in resistant spasticity
- Potentially serious side effects include overdosage, pump failure, infection, catheter movement, tolerance

Intrathecal Baclofen

Intrathecal Baclofen

- Meta-analysis – Int J Rehab Health, 1997
- Creedon et al
- 27 studies (7 randomised, placebo, double-blind) – 490 people
- Ashworth reduced 3.7 to 1.6
- Cumulative success was 78%
- Mean dose 205 for MS to 372 for SCI
- Less useful for CP but no clear criteria
- Costs - £11800 insertion and £500- £900 pa

Intrathecal Baclofen

- Long term studies
- WCN, London – Saltuari
- 30 people for 7 years
- Continuing benefit
- Significant side effects rare (sedation/nausea/hallucinations/anxiety)
- Catheter problems frequent
- Deterioration in urodynamic parameters and bowel motility
- Dedicated centres and team required

Intrathecal Medication

- Morphine
- Clonidine
- Phenol
  - 5ml of 5% phenol in glycerine
  - LP on side with head up
  - Pinder & Bhakta (IFPMR Amsterdam 2001)
    - 21 people – mainly MS
    - Improvement in all from slight (3/28) to complete (8/28) spasticity plus improved pain (7/9) and nursing problems (15/17)
    - 4 temporary complications
    - Maintenance of effect up to 2 years

Spasticity Management

- None
- External factors
- Seating/Positioning
- Physiotherapy
- Orthoses/Splints/Casts
- Oral Medication
- Nerve Blocks/Botulinum toxin
- Intrathecal techniques
- Surgery

Spasticity Management

Early intervention

Combination therapy

Team effort