Spinal Injuries Urology

The Basics

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Spinal Injuries Urology

- Spinal Injury Urology ??
- Basic bladder function
- Basic (very!) Neurophysiology / pathology
- Significance / Consequences of SCI
- General management principles and options
- Trouble shooting
- (Bowels and Sex)
<table>
<thead>
<tr>
<th>Mortality Rates</th>
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<tbody>
<tr>
<td>1941/45</td>
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<tr>
<td>Early 30%</td>
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<tr>
<td>2 years 57%</td>
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<tr>
<td>1946/50</td>
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<tr>
<td>Less than 2%</td>
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<tr>
<td>Less than 5%</td>
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</tbody>
</table>
Renal failure

- Incomplete bladder emptying
- Ureteric reflux and hydronephrosis
- High bladder pressures
- Urinary infection
- Kidney and bladder stones
- Hypercalcuria
- Amyloidosis
- Pressure sores
- Paralysis
Dr Ludwig “Pappa” Guttman

- “Turn Paralysed Individuals back in to tax payers”

- “Urinary Infection is main killer prevent this at all costs”
Bladder Function

• Collection and safe storage of Urine
  – “Storage”

• Expulsion of urine safely at socially acceptable time and place
  – “Voiding”
Basic physiology: the continence mechanism

**Bladder filling**

- **First sensation to void**
- **Normal desire to void**

**Emptying phase**

**Detrusor contracts**

- **Urethra relaxes**
- **Pelvic floor relaxes**

**MICTURITION**

- **Detrusor relaxes**
- **Urethra contracts**
- **Pelvic floor contracts**
Neurophysiology

Required properties

• Receptive relaxation during storage phase

• Coordinated detrusor contraction and Sphincter relaxation resulting in complete emptying at low pressure during voiding phase

• Ability to switch from one mode to the other as required
Basic Neuro-urology

Cortex
- Sensation
- Voluntary initiation and inhibition

PMC/PAG
- Co-ordination
- Completion of voiding

Spinal Reflexes
- Reflex bladder contraction
  Sacral micturition centre
- Guarding reflex
  Onuf’s nucleus
- Receptive relaxation
  ? Sympathetic
Spastic Spinal Cord Injury
(supra-conal lesion)

Lost
- Sensation
- Co-ordination
- Completion of voiding
- Voluntary initiation and inhibition

• Effect
- Reflex bladder
- Potentially unsafe

Features
- Reflex bladder contractions
- Detrusor sphincter dyssynergia
- Poorly sustained bladder contraction
Detrusor-Sphincter Dyssynergia

– Active contraction of the distal urethral striated sphincter during a reflex detrusor contraction.
DETRUSOR / SPHINCTER DYSYNERGIA
Autonomic Dysreflexia

- Massive sympathetic discharge in response to noxious stimulus below level of injury - Bladder, bowel, IGTN etc
- T6 and above
- Flushing, sweating, headache, high BP, bradycardia
- First aid
  - Change catheter
  - Check bowel
  - Medication
- Long term management
- n.b Potentially lethal
Flaccid Spinal Cord Injury
(conus lesion, decentralised bladder)

Lost
- Reflex bladder contractions
- Guarding reflex
- Receptive relaxation

• Effect
- Areflexic bladder
- Potentially unsafe

Features
- Absent bladder contractions
- Stress incontinence
- Risk of poor compliance
Poor Compliance
Cauda Equina/Peripheral Nerve Lesion

**Complete**
- Flaccid SCI
- Areflexic bladder
- Stress incontinence
- Risk of poor compliance

**Incomplete**
- Anything
- Root irritation/damage
Incomplete Spinal Cord Injury

- Effect
  - Reflex bladder
  - Variable sphincter function
  - Potentially unsafe
Spinal shock

- Cord reflexes completely inactive
- Over distension
- Over flow incontinence
- IDC
- IC staff then patient
Bladder recovery

• Depending on
  – Level, completeness, intact distal cord

• Affected by
  – Over distension, UTI, IDC, etc

• Timing ??
  – General recovery, reflexes, etc

• Aided by
  – Good care of flaccid bladder
Reflex type bladder

• Injuries above T12
• Intact distal cord and nerves
• Develops over time

• Pressures and Residuals depend on
  – Detrusor Contraction
  – Sphincter relaxation
  – MAY BE UNSAFE

• Risk of Autonomic Dysreflexia
Flaccid type bladder

• Injury to Distal cord / Cauda Equina / sacral nerves
• Below T12
• No recovery from spinal shock

• Pressures generally safe (BUT MAY NOT BE)
• No reflex detrusor contraction
• Weak sphincter

• Overflow incontinence

• No risk of autonomic dysreflexia
Objectives of bladder management

1. Prevention of Renal Damage
2. Prevention of Autonomic Dysreflexia
3. Preservation or restoration of Urinary Continence
4. Promotion of Independence
5. Preservation or restoration of Body Image and Sexuality
Factors to consider

- Nature and course of neurological problem
- Associated disabilities
- Level and completeness of injury
- Long term Rehabilitation Goals and potential
- Manual dexterity
- Carer situation
- Gender
- Patients preference
- Type of Bladder and outlet
- etc etc etc
Bladder Management

– Appropriate to bladder physiology

– Appropriate to disability

– Appropriate to patients wishes
• Conus Reflexes
  – Bulbo-cavernosus
  – Bulbo-anal
  – Anal
  – Catheter tug
  – S3-4
  – Somatic reflexes not visceral
Urodymanics

1900?

2000?
Managing a Reflex type bladder

• Three routes to choose from

1. Harness reflexes to empty bladder into sheath or pads

2. Suppress reflexes converting bladder to flaccid type and then empty regularly

3. Continuous urinary drainage via catheter or urinary diversion
Managing a Flaccid type bladder

• Regular complete drainage to prevent
  – Over distension and overflow incontinence
  – Residual urine and UTIs and Stones

• ISC
• IDC
• (Straining - “Crede”)
General principles of management

Safe storage (of adequate volumes)
Reducing pressures by
  – Anti cholinergics
  – Bo Tox
  – Cystoplasty

Safe and complete emptying
  – Sheath drainage
    +/- TUS / Stents
  – ISC
  – (Straining)
  – (Stimulation)

Permanent catheterisation
  – Urethral catheters
  – Suprapubic catheters
  – Managing catheter problems

Resolving sphincter weakness
  incontinence
  – Slings / colposuspension
  – Artificial urinary sphincters

Urinary Diversion
  – Ileal conduit
  – Continent Diversion
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Anticholinergic drugs

• This slide is intentionally left blank!
Anticholinergic drugs

- This slide is intentionally left blank!
- Actually they do have a useful if limited role
- Rarely sufficient to control Neurogenic DO
- May resolve symptoms without making bladder pressures safe
- Catheter related spasms and bypassing
- Assisting clip and release of catheters
Bo Tox

- Blocks cholinergic presynaptic nerve endings – chemical dennervation
- Recovery by neuronal sprouting (36/52)
- Paralyses target muscle
- Sphincteric injections not successful
- Detrusor injections via cystoscopy

- Works in 2/52, wears off slowly after 3/12, usually lasts 6-9/12
- UTI at time of injection reduces effect
- Effect of each dose variable
CLAM Augmentation Cystoplasty

- Abolishes detrusor contractions
- Reduces bladder pressures
- Protects kidneys
- Restores continence
- ISC mandatory
- Ileum or Sigmoid can be used
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Sheath Pros and Cons

• Pros
  – Catheter free
  – <UTIs and Stones
  – Natural cycle
  – Predictable dry times
  – Voids can be stimulated
  – Sexual function

• Cons
  – Leg bag etc
  – Body image
  – DSD bladder and kidney damage
  – UTIs and Stones with incomplete emptying
  – Boys only!
Sheath drainage problems

- **Penile sores**
  - IDC whilst heals and reassess sheath

- **UTIs**
  - ? Emptying
  - ? Upper tract problem
  - ? Stones
  - USS /Cysto/ VUD

- **Rising Residuals**
  - ? Significant
  - ? UTI, ? Upper tracts ? AD
  - USS / VUD
  - ? Add ISC ? TUS ? SPC

- **? Autonomic dysreflexia**
  - Sweats, headaches etc related to voiding
  - USS / VUD
  - ? TUS ? SPC
Intermittent Self Catheterisation

“Foundation for the modern management of neurogenic bladder dysfunction”

Lapides (J Urol 1972)

• Primary treatment
• Following surgery
• Suitable for both sexes
• Possible in wheelchair and surprisingly high injuries
• Consider Mitrofanoff to facilitate if Urethral ISC not possible
ISC Pros and Cons

• Pros
  – No IDC
  – Low UTI risk
  – Body image
  – Maintains bladder capacity
  – Sex

• Cons
  – Manual dexterity
  – Chore
  – Hygiene
  – Fluid restriction
  – Embarrassment and privacy issues
Mitrofanoff principle

Mitrofanoff principle

Appendix used into native bladder

Pressure within bladder or neobladder occludes submucosal tunneled section

Submucosal tunnel

Meso-appendix

Appendix

Catheterizable port

Internal opening of appendix tip
DIVISION 

CONTINENCE

STIMULATION

EMPTYING

Posterior roots

Anterior roots
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Urethral Catheter Pros and Cons

- **Pros**
  - Unlimited fluid intake
  - Low pressures “safe” kidneys
  - Easy for carers

- **Cons**
  - Permanent foreign body
  - Colonized smelly urine
  - UTIs
  - Stones
  - Bladder cancer
  - Urethral damage
  - Periurethral abscess
Urethral catheter trauma
Supra Pubic Catheters - Pros and Cons

• **Pros**
  – All of above
  – No urethral damage
  – Less bladder irritation
  – Urethral leakage
  – Easier to change
  – Bladder training
  – Sex and body image

• **Cons**
  – All of above w.r.t. UTI, stones etc
  – Difficulties with insertion and changes
  – Urethral leakage
Living with a catheter

- 14 or 16Fr Urethral MINIMUM 16Fr SPC
- Free flow or clip and release (If safe)
- High fluid intake
- Leg bags rather than Belly bags
- G Strap or similar
- Catheter hygiene
- Maximum change interval six weeks
- Minimum Change interval ??
  - Weekly if need be
- Bard Biocath
- Silicone only if latex allergic nb balloon problems
- AgNO3 ??
- No “routine” catheter maintenance flushes
- No “routine” CSUs
Catheter Blockages

- Mucinous debris or stones (30% of patients).
- Urease +ve UTI – CSU
- Upper tract stones – USS
- Cystoscopy versus radiology.
- Increase catheter size.
- Change catheter brand and frequency of changes.
- Consider regular catheter maintenance solutions.
- Possible role for acidification and low-dose antibiotic prophylaxis.
Catheter bypassing

- ? Blocked or Bladder spasm
- ? Stones
- ? UTI
- ? Urethral erosion
- ? Bladder / general spasm
- Reduce balloon size
- DO NOT INCREASE URETHRAL CATHETER SIZE
- Anticholinergics
- Cysto and BWO and BOTOX
Supra pubic Catheter Changes

• First change not before 10 days and usually in outpatients
• Thereafter maximum six week interval
• No delay in inserting new catheter.
• Advance catheter well into bladder.
• Care when inflating balloon.
• Track can be salvaged with ISC catheters within a few hours
• Patients or carers to learn to change catheter.
Catheters and UTIs

Recurrent Urinary infection
• ? UTI or colonisation
• ? Adequate treatment
  – 10/7, increase ISC frequency, ? Change IDC
• ? Stones etc – USS and cystoscopy
• ? Low dose ROTATING antibiotics
• ? Precipitated by changes – Prohylactic ABs

Suprapubic site infection:
• Local Hygiene
• Topical ABs
Low Dose antibiotics

- Simply promote resistant strains?
- Many SCI (and other) patients swear by them
- My Low Dose Antibiotic rules
  - Select 3 or 4 Antibiotics patient can tolerate
  - Give once a day low dose
  - Rotate every 3 months
  - If UTI occurs on AB A stop it start AB B at Rx doses for 10/7 then continue on low dose of AB B for 3/12 or next UTI then change to AB C
  - never discuss with microbiologists!
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Urinary Diversion
  – Ileal conduit
  – Continent Diversion
Urinary Diversion

• “last resort”
  – Hopeless bladder
  – Hopeless urethra
  – Bladder cancer
• Patient choice

• Ileal conduit
• Continent diversion
A segment of ileum 5 cm from the ileocaecal junction is isolated.

Nipple

Conduit

Ureters are brought to the base of the conduit and the other end brought out onto the surface as a nipple.
Complications Cystoplasty and urinary diversion

- Bowel disturbance with diarrhoea.
- Renal dilatation and deterioration.
- Recurrent UTI.
- Metabolic acidosis.
- Vitamin B12 deficiency.
- Mucus production.
- Stone formation.
- Perforation.
- Malignancy.
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SUI after SCI: Aetiology

• Damage to the sacral cord, sacral roots or peripheral nerves.
• Chronic urethral catheterisation.
• Iatrogenic - sphincterotomy or dorsal rhizotomy.
• Non-neuropathic - childbirth related.
Pubo-vaginal Sling
Artificial Urinary Sphincter
SUI and Bladder Pressure

Low LPP

SAFE but WET

- High LPP
- Normal compliance
- ISC

SAFE and DRY

- High LPP
- Poor compliance
- Penile sheath/pads

POTENTIALLY DANGEROUS
Miscellaneous Complications

• Bladder cancer – increased risk but unquantified.
• Renal scarring – 50% of patients at post mortem.
• Renal stones – 8% in 3 years with indwelling catheter (4% with ISC).
• Psychological and sexual difficulties.
• Effects on fertility.
Changing bladder function

- Ageing – “Knackered bladder syndrome”
- Ageing – mental and physical abilities decline
- New neurology
  - Syringomyelia
  - New cord injury or infarction
- Late Detrusor Sphincter Dyssynergia
- UTIs
- Stones
- (bladder cancers)
## Upper tract deterioration

### Sheffield admissions 1976-1985

<table>
<thead>
<tr>
<th>Region</th>
<th>Cases (Total)</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cervical</td>
<td>16/156</td>
<td>10%</td>
</tr>
<tr>
<td>Dorsal</td>
<td>26/143</td>
<td>18%</td>
</tr>
<tr>
<td>Lumbar</td>
<td>8/42</td>
<td>19%</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>50/341</strong></td>
<td><strong>15%</strong></td>
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- 2 Deaths from Renal Failure
- 3 Deaths from Autonomic Dysreflexia

### Surveyed in 2000

<table>
<thead>
<tr>
<th>Region</th>
<th>Cases (Total)</th>
<th>Percentage</th>
</tr>
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<tbody>
<tr>
<td>Females (n = 87)</td>
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<td></td>
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<tr>
<td>Dilation post ileal conduit</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Unilateral scarring</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Stone</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3/87</strong></td>
<td><strong>3.4%</strong></td>
</tr>
</tbody>
</table>

**Total** 3/87 (3.4%)
Bladder Management - Conclusions

• Central to survival
  – Renal Failure
  – Autonomic Dysreflexia

• Central to quality of life
  – Continence
  – Sexual function
  – Independence

• Options +++

• Lifelong surveillance mandatory
Thank You