Cauda Equina Syndrome

The Challenges of Early Diagnosis

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Vulnerable Anatomy;
A surgical emergency

Cauda Equina first described in 1600

CE provides innervation to lower limbs, sphincter, sensory innervation to saddle and parasympathetic innervation to bladder and distal bowel.

- no Schwann cell cover
- hypovascularity
Cauda Equina Syndrome (CES)

Syndrome not described until 1934 by Mixter and Barr.

In 2017 we are still improving our approach to CES.

An orthopaedic surgical emergency.

NEW ENGLAND SURGICAL SOCIETY

RUPTURE OF THE INTERVERTEBRAL DISC WITH INVOLVEMENT OF THE SPINAL CANAL

BY WILLIAM JASON MIXTER, M.D., AND JOSEPH S. BARR, M.D.
Cauda Equina Syndrome; A surgical emergency

- Rare and disabling

‘Life Changing’

1/5 patients will have poor outcome;
- on-going treatment for sexual dysfunction
- self catheterisation
- colostomy
- psycho-social
Clinical Diagnosis

- Until recently no broadly accepted definitive diagnostic criteria; 17 different definitions of CES recorded (Fraser et al, 2009)

- Initial signs and symptoms are often subtle and vague, varying in intensity and evolution (Bin et al, 2009)
A patient presenting with acute *(de-novo or as an exacerbation of pre-existing symptoms)* back pain and/or leg pain *WITH a suggestion of a disturbance of their bladder or bowel function and/or saddle sensory disturbance should be suspected of having or developing a cauda equina syndrome.*

Most of these patients will not have critical compression. However, in the absence of reliably predictive symptoms and signs, there should be a low threshold for investigation with an EMERGENCY MRI scan. The reasons for not requesting a scan should be clearly documented.

**Subjective history key to early diagnosis**
# Cauda Equina Syndrome Groups

*(Todd & Dickson, 2016)*

<table>
<thead>
<tr>
<th>CESS</th>
<th>Bilateral radicular pain (progressing unilateral)</th>
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<tbody>
<tr>
<td>CESI</td>
<td>Urinary difficulties of neurogenic origin, altered urinary sensation, loss of desire to void, poor urinary stream, need to strain to micturate</td>
</tr>
<tr>
<td>CESR</td>
<td>Painless urinary retention and overflow incontinence</td>
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<tr>
<td>CESC</td>
<td>Objective loss of CE function, absent perineal sensation, patulous anus, paralysed insensate bladder and bowel</td>
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</table>

*The probability of a CES patient deteriorating, with what speed and to what level is not predictable*
The Diagnostic Challenge

Significantly more patients are referred on for further investigation compared with those having a radiologically confirmed diagnosis of CES.

Bladder and bowel dysfunction, saddle anaesthesia and sexual dysfunction are all multifactorial in their causes e.g. Comorbidities, medication, pain.

(Woods et al, 2015)
CES Masqueraders;
Epidural Compression Syndrome
(Stopler et al, 2016)

- Compression of spinal cord, conus medullaris or cauda equina
- Thoracic lesions can masquerade as cauda equina syndrome
- Masqueraders include thoracic disc, thoracic meningioma, ligament ossification and thoracic cord tumour
- Rare; disease v resources
Abdominal Aortic Aneurysm
(Engamba et al., 2017)

- Middle-aged and elderly patients with lower limb pain and/or neuropathy, in the context of a history of abdominal aortic aneurysm (AAA).
- Haematoma causing mass effect on neural structures
Bladder & Bowel, Sexual Dysfunction Red Herrings

- Opioid Salts; constipation (e.g. Tramadol, Codeine)
- Anticonvulsants; urinary incontinence (e.g. Gabapentin, Pregabalin)
- Antidepressants; retention, sexual dysfunction (e.g. Amitriptyline, Nortriptyline)
## Pharmacology causes of Sexual Dysfunction

<table>
<thead>
<tr>
<th>Class</th>
<th>Drug</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hypnotics</strong></td>
<td>Benzodiazepines</td>
</tr>
<tr>
<td><strong>Antihypertensive</strong></td>
<td>Beta blockers</td>
</tr>
<tr>
<td><strong>Antidepressants</strong></td>
<td>Tricyclic antidepressants; Selective serotonin reuptake inhibitors e.g fluoxetine; Monoamine oxidase inhibitors; Viloxamine and L-tryptophan; Nefazodone; Vanlafaxine; Reboxetine; Mirtazepine; Trazodone; Duloxetine</td>
</tr>
<tr>
<td><strong>Diuretics</strong></td>
<td>Bendroflurazide</td>
</tr>
<tr>
<td><strong>Anti-epileptics</strong></td>
<td>Carbamazepine; Phenytoin; Sodium valproate</td>
</tr>
<tr>
<td><strong>Antipsychotics</strong></td>
<td>Thioridazine; aliphatic phenothiazines e.g chlorpromazine, sulprides atypical antipsychotic risperidone</td>
</tr>
<tr>
<td><strong>Prostate medications</strong></td>
<td>Finasteride (BPH); Anti androgens e.g. cyproterone acetate, flutamide (Prostate Cancer); Gonadotrophin releasing hormone analogues e.g goserelin, leuprolrelin (Prostate Cancer)</td>
</tr>
<tr>
<td><strong>Anti-parkinsonian drugs</strong></td>
<td>L-dopa</td>
</tr>
<tr>
<td><strong>Recreational drugs</strong></td>
<td>Psychostimulants, Amphetamine, Ecstacy, Crystal methamphetamine, Alcohol, Anabolic steroids, cannabis, Opiates (Heroin, Methadone, Buprenorphine), Poppers, Tobacco</td>
</tr>
</tbody>
</table>
Pharmacological agents associated with urinary retention

<table>
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<tr>
<th>Class</th>
<th>Drugs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antiarrhythmics</td>
<td>Disopyramide, procainamide, quinidine</td>
</tr>
<tr>
<td>Anticholinergics</td>
<td>Atropine (Atreza), belladonna alkaloids, dicyclomine (Bentyl), flavoxate (Urispas), glycyrrolate (Robinul), hyoscymine (Levsin), oxybutynin (Ditropan), propantheline (Pro-Banthine), scopolamine (Transderm Scop)</td>
</tr>
<tr>
<td>Antidepressants</td>
<td>Amitriptyline, amoxapine, doxepin, imipramine, maprotiline, nortriptyline</td>
</tr>
<tr>
<td>Antihistamines (selected)</td>
<td>Brompheniramine, chlorpheniramine, cyproheptadine, diphenhydramine, hydroxyzine</td>
</tr>
<tr>
<td>Antihypertensives</td>
<td>Hydralazine, nifedipine</td>
</tr>
<tr>
<td>Antiparkinsonian agents</td>
<td>Amantadine, Benztropine, bromocriptine, levodopa, trihexyphenidyl</td>
</tr>
<tr>
<td>Antipsychotics</td>
<td>Chlorpromazine, fluphenazine, haloperidol, prochlorperazine, thioridazine</td>
</tr>
<tr>
<td>Hormonal agents</td>
<td>Estrogen, progesterone, testosterone</td>
</tr>
<tr>
<td>Muscle relaxants</td>
<td>Baclofen, cyclobenzaprine, diazepam</td>
</tr>
<tr>
<td>Sympathomimetics (alpha-adrenergic agents)</td>
<td>Ephedrine, phenylephrine (Neo-Synephrine); phenylpropanolamine, pseudoephedrine (Sudafed)</td>
</tr>
<tr>
<td>Sympathomimetics (beta-adrenergic agents)</td>
<td>Isoproterenol (Isuprel); metaproterenol (Alupent); terbutaline (Brethine)</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>Amphetamines, carbamazepine, dopamine, mercurial diuretics, nonsteroidal anti-inflammatory drugs</td>
</tr>
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## Causes of Urinary Retention

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<tr>
<th>Cause</th>
<th>Men</th>
<th>Women</th>
<th>Both</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Obstructive</strong></td>
<td>Benign prostatic hyperplasia, meatal stenosis, paraphimosis, penile constricting bands, phimosis, prostate cancer</td>
<td>Organ prolapse (cystocele, rectocele, uterine prolapse); pelvis mass (gynaecological malignancy, uterine fibroid, ovarian cyst); retroverted impacted gravid uterus</td>
<td>Aneurysmal dilation; bladder calculi; bladder neoplasm; faecal impaction; gastrointestinal or retroperitoneal malignancy/mass; urethral strictures, foreign bodies, stones, edema</td>
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<tr>
<td><strong>Infectious or inflammatory</strong></td>
<td>Prostatic abscess, prostatitis</td>
<td>Acute vulvovaginitis; vaginal lichen planus; vaginal lichen sclerosis; vaginal pemphigus</td>
<td>Bilharziasis; cystitis; echinococcosis; Guillain-Barre syndrome; herpes simplex virus; Lyme disease; periurethral abscess; transverse myelitis; tubercular cystitis; urethritis; varicella zoster virus</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td>Penile trauma, fracture, laceration</td>
<td>Postpartum complication; urethral sphincter dysfunction (Fowler’s syndrome)</td>
<td>Disruption of posterior urethra and bladder neck in pelvic trauma; postoperative complication; psychogenic</td>
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## Neurological Causes of Urinary Retention

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<th>Lesion type</th>
<th>Causes</th>
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<tr>
<td><strong>Autonomic or peripheral nervous system</strong></td>
<td>Autonomic neuropathy; diabetes mellitus; Guillain-Barre Syndrome, herpes zoster virus; Lyme disease; pernicious anaemia; poliomyelitis; radical pelvis surgery; spinal cord trauma; tabes dorsalis</td>
</tr>
<tr>
<td><strong>Brain</strong></td>
<td>Cerebrovascular disease; concussion; multiple sclerosis; neoplasm or tumour; normal pressure hydrocephalus; Parkinson’s disease, Shy-Drager Syndrome</td>
</tr>
<tr>
<td><strong>Spinal cord</strong></td>
<td>Dysraphic lesions; invertebral disc disease; meningomyelocele; multiple sclerosis; spina bifida occulta; spinal cord hematoma or abscess; spinal cord trauma; spinal stenosis; spinovascular disease; transverse myelitis tumours or masses of conus medullaris or cauda equina</td>
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Results of Emergency lumbar MRI - Then what? (Germon et al, 2015)

- Cauda equina compression confirmed; urgent surgical referral
- Cauda equina compression excluded but a potential structural explanation of pain identified; referral to the appropriate surgical service.
- Non-compressive pathology may be identified (for example, demyelination); referral to the appropriate service.
- No explanation of the patient’s symptoms; probably appropriate to refer back to the GP

……or MRI higher?
…..or could there be a lesion in the abdomen or pelvic cavity
“All CES patients should have emergency imaging and treatment as soon as practically possible to maximise good outcomes” (Todd, 2015)

“Nothing is to be gained by delaying surgery and potentially much to be lost”

British Association of Spinal Surgeons standards of care for cauda equina syndrome (2015)
Aim of surgery is to preserve function present at the time of surgery.

There is scope for improvement, but small risk of deterioration e.g. paralysis, loss of bladder and bowel control, impotence/sexual dysfunction.

Bladder function at time of surgery important.
Working with Patients as Partners

- ‘the number one ‘spinal’ patient safety issue’....average compensation following delayed diagnosis -£336,000 in the United Kingdom (Fairbank, 2014)

- What is the patient experience of onset of CES symptoms?
What can we learn from our patients?

Dermatomes $S_3, S_4, S_5$
Dermatomes $S_3, S_4, S_5$
A Qualitative Investigation into Patients Experience of Cauda Equina Syndrome
Physiotherapy Research Foundation (PRF) Grant

Aim
To identify how CES symptoms may be effectively shared between patients and clinician

Objectives
Drawing upon patient experience of signs and symptoms associated with CES including changes in bladder, bowel and sexual function
- what symptoms patients actually suffer
- patients own reasoning of these symptoms
- the patient experience of divulging this information
7 themes emerged

- Catastrophic Pain
- Impact on Life
- Common Symptoms / Varying Chronology
- Sense of change / Seriousness
- Contact with Health Professionals
- Carers Experience
- Suggestions to aid early diagnosis
Catastrophic Pain
Catastrophic Pain

- ‘.... The woman who was doing the MRI said oh gosh. I was all screaming and hyperventilating and she said are you ok, are you claustrophobic? I said I’m in bloody agony-Strong pain, pain in whole pelvis, real agony’

- ‘I don’t think his questions weren’t clear, I think that it was impossible to concentrate on anything other than pain management’.
‘……It was like you could not tell where your feet were in space’
‘I was sort of losing control… my legs weren’t working properly like they were made of rubber.’ ‘it was as if I had been riding a horse for a week or something and obviously that was to do with the saddle numbness.

‘The first thing to go was my bladder function’
'I had no comprehension that this could have permanently affected my mobility and my life...through all of this and through all the pain, and through all the people that; the ambulances, the GP I’d seen at night, it was only when the Consultant said to me just before the surgery you’re within the forty eight hour window so your prospects are quite good. I didn’t appreciate there was anything but all they had to do was take this pain away’

N.B Importance of safety netting those at risk
Contact with Health Professionals

Usually already under health professionals care

They really do need to listen to you and they need to listen to your individual circumstances.

“If I had been told numbness around back passage or genitals...everyone I saw who was medically trained called it saddle numbness”

No clear safety net advice
Suggestions to aid early diagnosis

Cauda Equina Syndrome Warning Signs

- Loss of feeling/pins and needles between your inner thighs or genitals
- Numbness in or around your back passage or buttocks
- Altered feeling when using toilet paper to wipe yourself
- Increasing difficulty when you try to urinate
- Increasing difficulty when you try to stop or control your flow of urine
- Loss of sensation when you pass urine
- Leaking urine or recent need to use pads
- Not knowing when your bladder is either full or empty
- Inability to stop a bowel movement or leaking
- Loss of sensation when you pass a bowel motion
- Change in ability to achieve an erection or ejaculate
- Loss of sensation in genitals during sexual intercourse

Pain is easier to communicate!
The questions and the patient’s response should be clearly documented in the medical record.

- Medico-legal viewpoint
- Assists practitioners in recognising changes e.g CESI to CESR
Clinicians must educate patients and make them effective self-advocates. (Strigenz, 2014)

Patients with existing risk factors must be made aware of ‘Red Flags’; need for patient education of new or vague symptoms. (Mitchelle et al, 2012)

CES requires proper patient information (Korse et al, 2013).

Despite this clear message much of the documentation directed towards patients uses medical terminology ‘Bowel and/or bladder dysfunction with saddle and perineal anaesthesia’ (Egton Medical Information Systems, 2015)

Good Communication is key
Safety Netting
Local Pathways

Will I know what to do on Friday afternoon?
Prognosis

- Degree of neurological deficit, duration of compression, speed of onset (Todd & Dickson, 2016)

- ‘bringing the individual patient and the surgical team together at the earliest practical opportunity’ (Sonntag, 2014)
Working with patients as partners we can make a difference
Cauda Equina Syndrome; A surgical Emergency
Acknowledgements

- Danish musculoskeletal physiotherapy association
- Physiotherapy Research Foundation (PRF)
- Patients who freely shared their experience to enable us to learn
- Professor James Selfe, Professor Carole Truman C, Professor Valerie Webster
Thank you for listening

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