

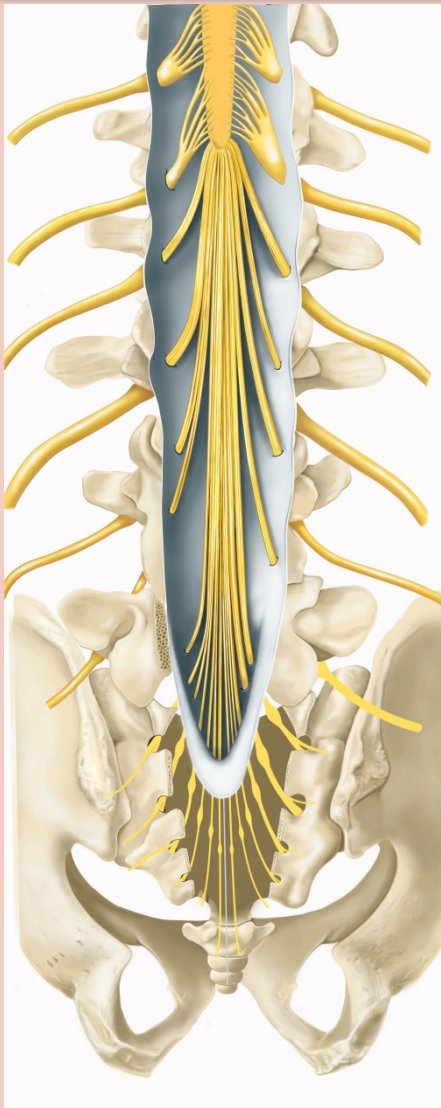
# Cauda Equina Syndrome

## The Challenges of Early Diagnosis

Dr Sue Greenhalgh  
Consultant Physiotherapist  
Royal Bolton NHS Foundation Trust  
[Susan.greenhalgh@boltonft.nhs.uk](mailto:Susan.greenhalgh@boltonft.nhs.uk)



# 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.

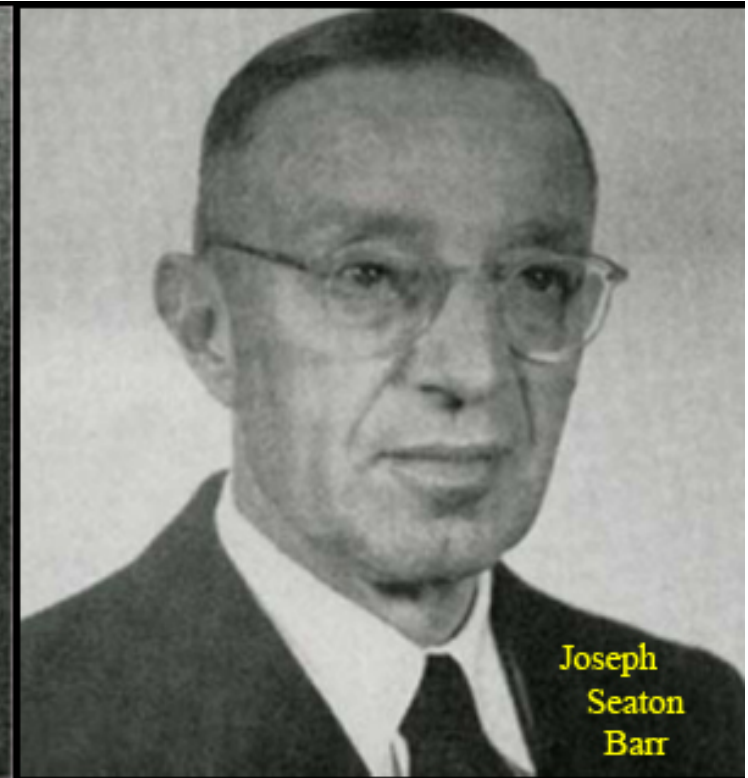
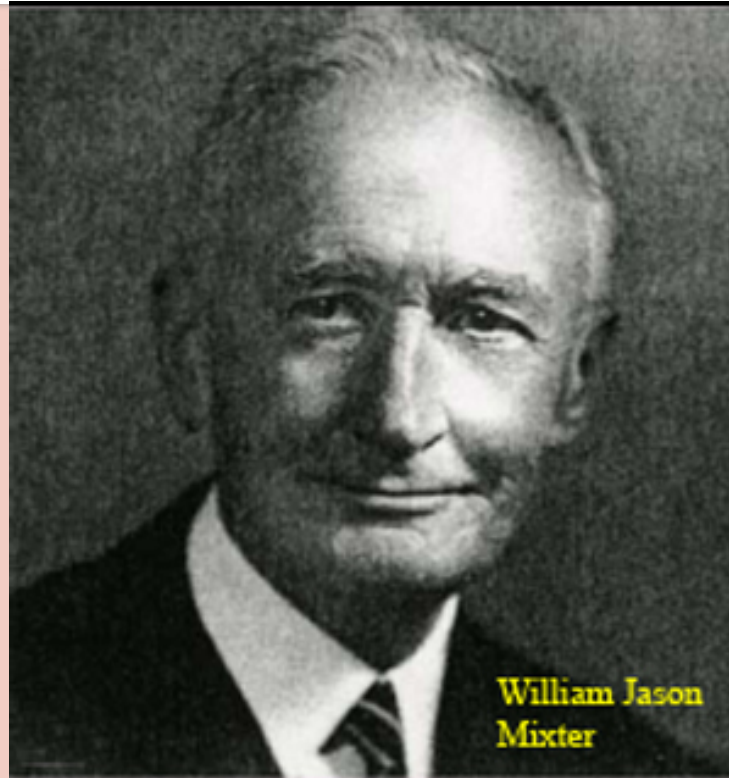
- **no Schwann cell cover**
- **hypovascularity**

# 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*



210

NEW ENGLAND SURGICAL SOCIETY—MIXTER AND BARR

N. E. J. OF M.  
AUG. 2, 1934

## 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)





## British Association of Spinal Surgeons (BASS) definition in Standards of Care, (Germon et al, 2015)

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)

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

**'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

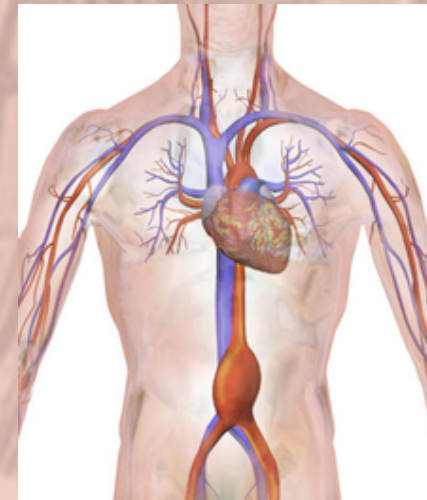
(Stopler et al, 2016)

- 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

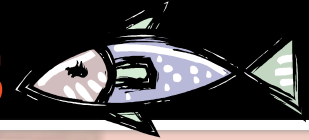
# Abdominal Aortic Aneurysm

(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

Class	Drug
<b>Hypnotics</b>	Benzodiazepines
<b>Antihypertensive</b>	Beta blockers
<b>Antidepressants</b>	Tricyclic antidepressants; Selective serotonin reuptake inhibitors e.g fluoxetine; Monoamine oxidase inhibitors; Viloxazine and L-tryptophan; Nefazodone; Venlafaxine; Reboxetine; Mirtazepine; Trazodone; Duloxetine
<b>Diuretics</b>	Bendroflurazide,
<b>Anti-epileptics</b>	Carbamazepine; Phenytoin; Sodium valproate
<b>Antipsychotics</b>	Thioridazine; aliphatic phenothiazines e.g chlorpromazine, sulprides atypical antipsychotic risperidone
<b>Prostate medications</b>	Finasteride (BPH); Anti androgens e.g. cyproterone acetate, flutamide (Prostate Cancer); Gonadotrophin releasing hormone analogues e.g goserelin, leuprorelin (Prostate Cancer)
<b>Anti-parkinsonian drugs</b>	L-dopa
<b>Recreational drugs</b>	Psychostimulants, Amphetamine, Ecstasy, Crystal methamphetamine, Alcohol, Anabolic steroids, cannabis, Opiates (Heroin, Methadone, Buprenorphine), Poppers, Tobacco

# Pharmacological agents associated with urinary retention

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

1. Selius, B. and Subedi, R. (2008). Urinary Retention in Adults: Diagnosis and Management. American Family Physician, 77 (5), 643-650.



# Causes of Urinary Retention

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

1. Selius, B. and Subedi, R. (2008). Urinary Retention in Adults: Diagnosis and Management. *American Family Physician*, 77 (5), 643-650.

# Neurological Causes of Urinary Retention

Lesion type	Causes
<b>Autonomic or peripheral nervous system</b>	Autonomic neuropathy; <a href="#">diabetes mellitus</a> ; Guillian-Barre Syndrome, herpes zoster virus; Lyme disease; pernicious anaemia; poliomyelitis; radical pelvis surgery; spinal cord trauma; tabes dorsalis
<b>Brain</b>	Cerebrovascular disease; concussion; <a href="#">multiple sclerosis</a> ; neoplasm or tumour; normal pressure hydrocephalus; Parkinson's disease, Shy-Drager Syndrome
<b>Spinal cord</b>	Dysraphic lesions; intervertebral 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

1. Selius, B. and Subedi, R. (2008). Urinary Retention in Adults: Diagnosis and Management. *American Family Physician*, 77 (5), 643-650.

# Neurological Causes of Urinary Retention

Lesion type	Causes
<b>Autonomic or peripheral nervous system</b>	Autonomic neuropathy; <a href="#">diabetes mellitus</a> ; Guillian-Barre Syndrome, herpes zoster virus; Lyme disease; pernicious anaemia; poliomyelitis; radical pelvis surgery; spinal cord trauma; tabes dorsalis

**NEVER ASSUME**

trauma; spinal stenosis; spinovascular disease; transverse myelitis tumours or masses of conus medullaris or cauda equina

1. Selius, B. and Subedi, R. (2008). Urinary Retention in Adults: Diagnosis and Management. *American Family Physician*, 77 (5), 643-650.

# 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

# Surgical Intervention

- “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)





# Surgery

- 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



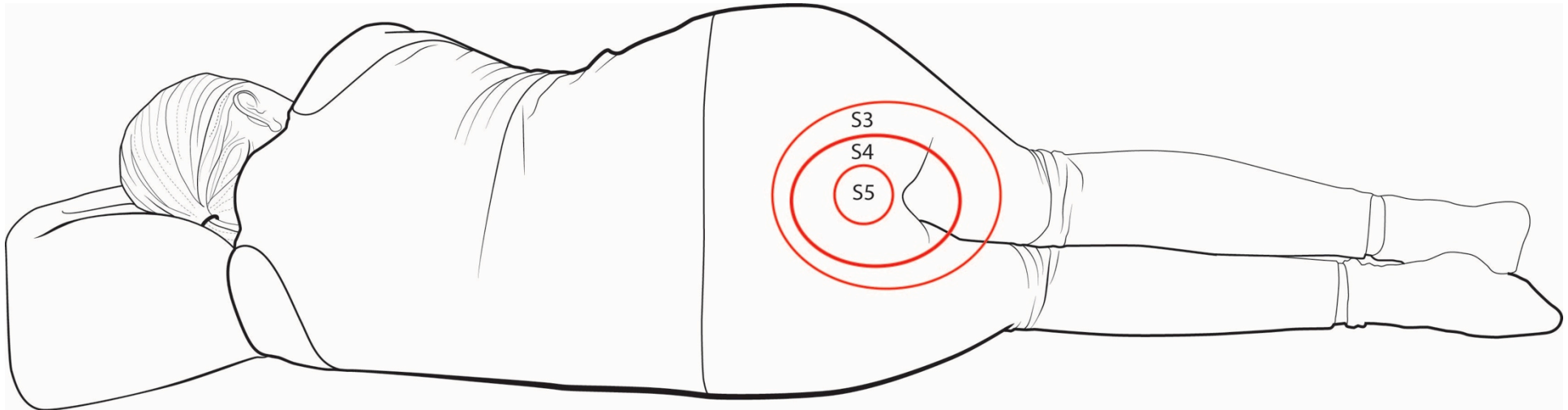
# Working with Patients as Partners

- '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?

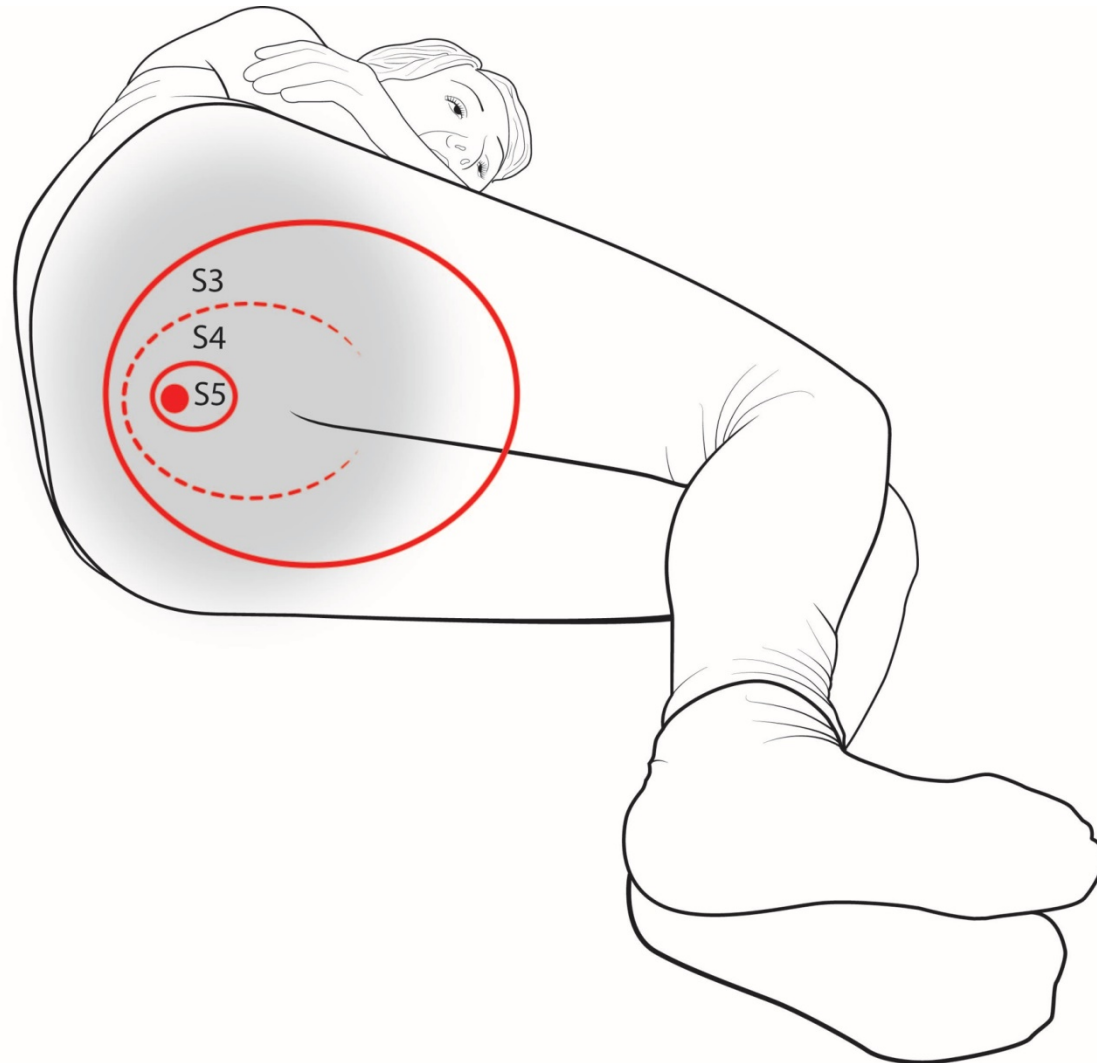


# What can we learn from our patients?

## Dermatomes S<sub>3,4,5</sub>



# Dermatomes S<sub>3,4,5</sub>



# A Qualitative Investigation into Patients Experience of Cauda Equina Syndrome

Greenhalgh S, Truman C, Webster V, Selfe J (2015)  
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'.*

## Common Symptoms / Varying Chronology

*'.....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'*

# Sense of change / Seriousness

*'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.*

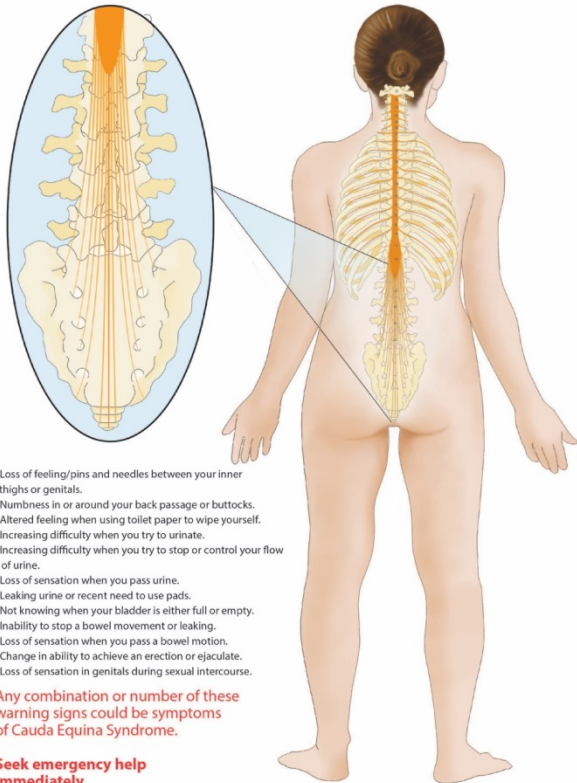
*"If I had been told numbness around back passage or genitals...everyone I saw who was medically trained called it saddle numbness"*

*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.

Any combination or number of these warning signs could be symptoms of Cauda Equina Syndrome.

**Seek emergency help immediately**

© Bolton NHS Foundation Trust 2015. All rights reserved. Not to be reproduced in whole or in part without permission of the copyright owner.



## 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

**Any  
combination  
seek help  
immediately**

***Pain is easier to communicate!***

# Documentation

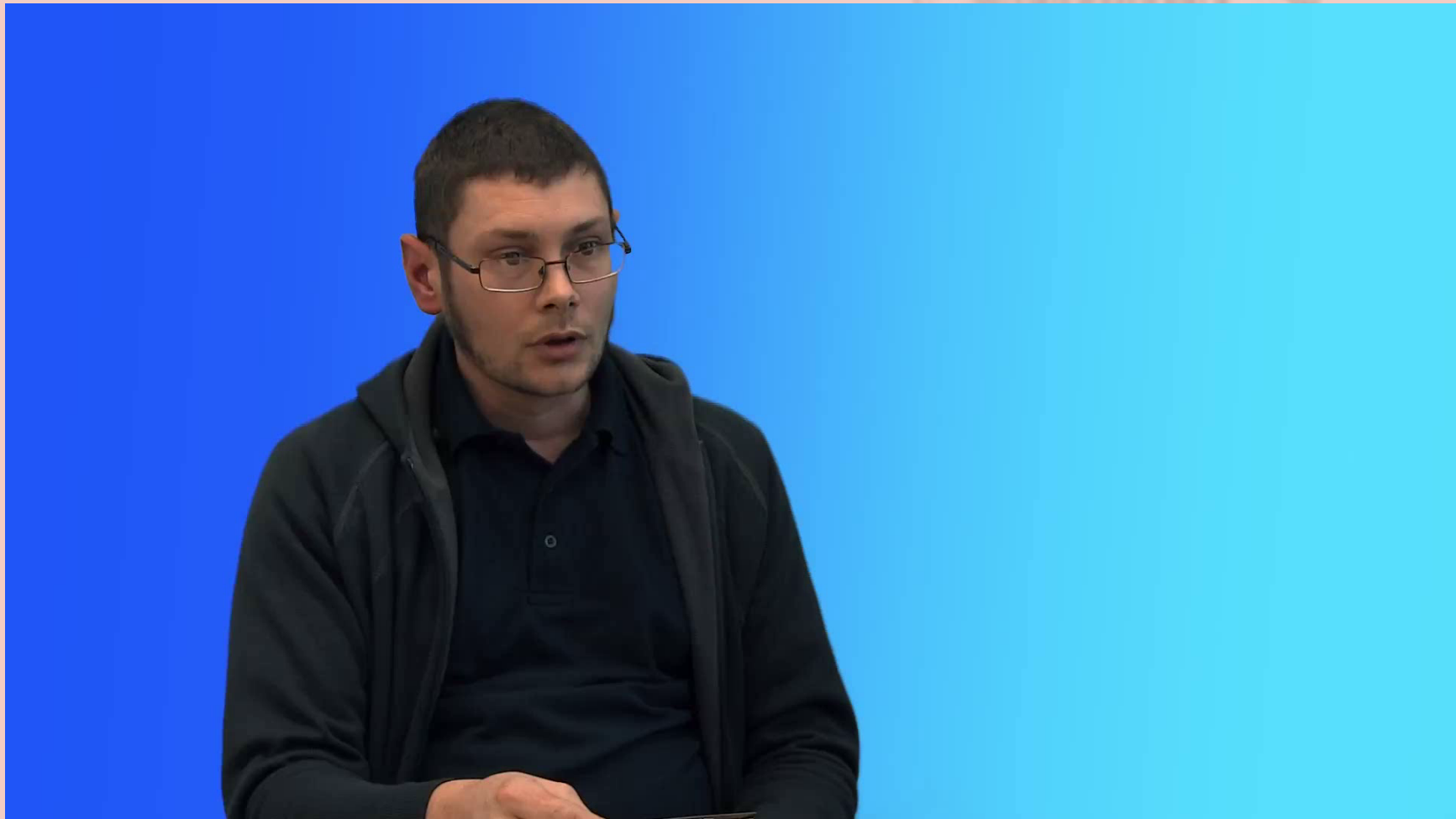
- The questions and the patient's response should be clearly documented in the medical record
- Medico-legal viewpoint
- Assists practitioners in recognising changes e.g CESI to CESR

# Patient literature

- 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)

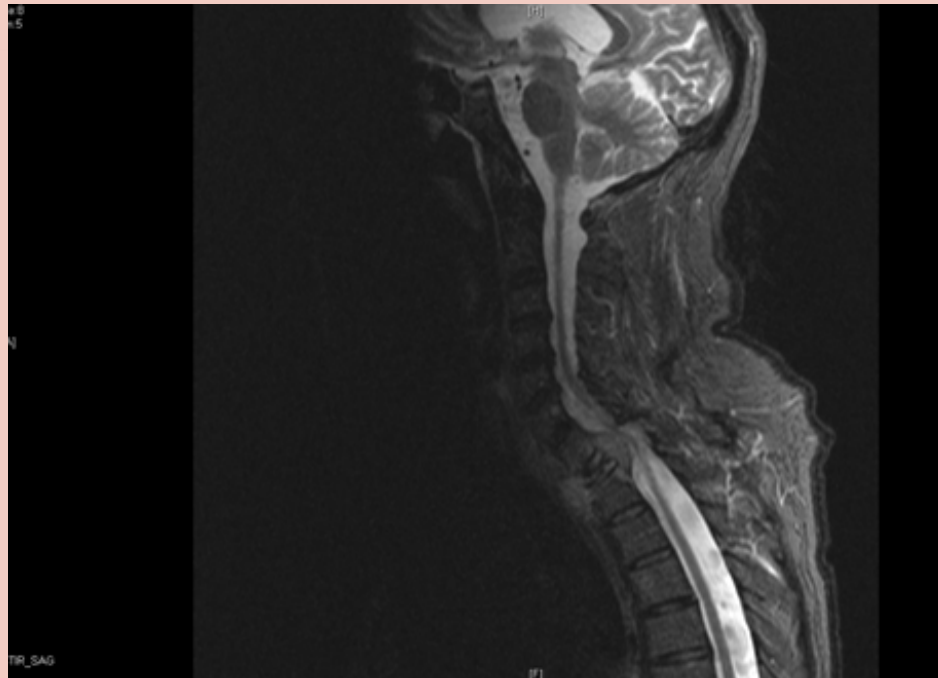
***Good Communication is key***

# Safety Netting





# Local Pathways

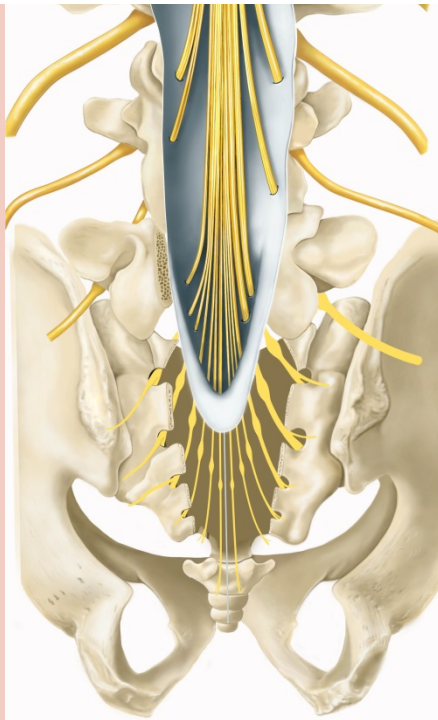
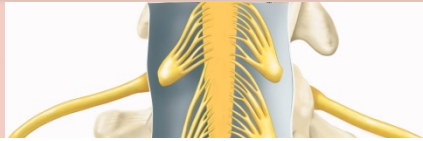


Will I know what to do on Friday afternoon?

# 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*

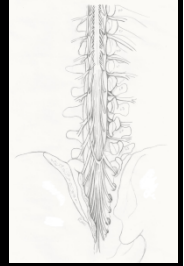


# Cauda Equina Syndrome; A surgical Emergency



Available  
May 2017;  
CSP

# 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

*Dr Sue Greenhalgh*

[susan.greenhalgh@boltonft.nhs.uk](mailto:susan.greenhalgh@boltonft.nhs.uk)



# References

Bin, M. Hong, W. Lian-shun, J. Wen, J. Guo-dong, S. Jian-gang, S. 2009: Cauda equina syndrome: A review of clinical progress. *Chin Med J* 122:1214-22

Engamba S. Garaleviciene D. Baldry, J 2017: Contained ruptured abdominal aortic aneurysm presenting as cauda equina syndrome. *British Medical Journal*

Fraser S, Roberts L, Murphy, E, 2009: Cauda equina syndrome; a literature review of its definition and clinical presentation. *Arch Phys Med Rehabil* 11;1964-8

Germon, T. Ahuja, S, Casey, A, Rai, A. British Association of Spinal Surgeons standards of care for cauda equine syndrome 2015. *The Spine Journal*

Greenhalgh S, Truman C, Webster V, Selfe J 2015: An Investigation into the Patient Experience of Cauda Equina Syndrome (CES). *Physiotherapy Practice and Research*

Greenhalgh S, Truman C, Webster V, Selfe J. 2016; Development of a toolkit for early identification of cauda equina syndrome. *Primary Health Care Research & Development*.

Selius B. and Subedi R. 2008; Urinary retention in Adults; Diagnosis and Management. *American Family Physician*. 77 (5), 643-650

Stopler, K. Hanlin E. April M. Ritter J. Hunter C. Samsey K. Maddry, J 2016: Thoracic spinal cord compression masquerading as cauda equina syndrome. *American Journal of Emergency Medicine*. 34 756.e3-756.e5

Smith S. 2007: Drugs that cause sexual dysfunction. *Psychiatry*. 6(3), 111-114

Todd NV and Dickenson, R A. 2016; Standards of care in cauda equina syndrome. *British Journal of Neurosurgery*. Vol 30, no 5, 518-522

Woods E, Greenhalgh S, Selfe J. 2015; Cauda Equina Syndrome and the challenge of diagnosis for physiotherapists: a review *Physiotherapy Practice and Research*