

Time to implement a national referral pathway for suspected cauda equina syndrome: review and outcome of 250 referrals

Muhammad Masood Hussain, Adam Alexander Razak, Syed Sibet Hassan, Kishor A. Choudhari & George Michael Spink

To cite this article: Muhammad Masood Hussain, Adam Alexander Razak, Syed Sibet Hassan, Kishor A. Choudhari & George Michael Spink (2018): Time to implement a national referral pathway for suspected cauda equina syndrome: review and outcome of 250 referrals, British Journal of Neurosurgery, DOI: [10.1080/02688697.2018.1457771](https://doi.org/10.1080/02688697.2018.1457771)

To link to this article: <https://doi.org/10.1080/02688697.2018.1457771>



Published online: 02 Apr 2018.



Submit your article to this journal [↗](#)



Article views: 10



View related articles [↗](#)



View Crossmark data [↗](#)

Time to implement a national referral pathway for suspected cauda equina syndrome: review and outcome of 250 referrals

Muhammad Masood Hussain, Adam Alexander Razak, Syed Sabet Hassan, Kishor A. Choudhari and George Michael Spink

Department of Neurosurgery, Hull Royal Infirmary, Hull, UK

ABSTRACT

Introduction: Cauda equina syndrome (CES) is a condition with significant implications and medico-legal profile. The literature still lacks large primary studies to provide strong evidence for a robust management pathway. Statements from Neurosurgical and Spinal societies support early diagnosis and imaging but this has not resulted in any noticeable shift in referral pattern. We strongly feel the need for a nationally agreed, evidence-based referral pathway in practice. We present our large series and in-depth analysis of the referral pathway to provide strong evidence for more robust referrals and management.

Methods: We reviewed 250 referrals of suspected CES (sCES) to the regional neurosurgical unit, evaluating the importance of clinical findings and the imaging pathway.

Results: After clinico-radiological evaluation only 32 (13%) had confirmed CES requiring urgent surgery. There was no significant difference in terms of clinical presentation between these true cases of CES (tCES) and false cases (fCES). Imaging was therefore the key rate-limiting step. MRI was the most common investigation used. 73 patients presented without imaging out of hours (OOH). In this group, investigation was delayed to the next day in 60/73 (82%) patients while only 13 (18%) patients underwent OOH MRI. Only 2 (3%) were able to have this at their local hospital.

Conclusions: As with previous studies we conclude that signs/symptoms are insufficient to identify tCES. Taking into consideration the improved outcome with early diagnosis, the importance of early scanning in diagnosing tCES, and the poor availability of OOH MRI scanning outside of neurosurgical units, we recommend a national policy of 24/7 MRI availability for cases of sCES at all hospitals with MRI scanners. This would remove the 87% of patients not requiring urgent surgery from an unnecessary and distracting referral process.

ARTICLE HISTORY

Received 29 August 2017

Revised 23 January 2018

Accepted 21 March 2018

KEYWORDS

Suspected cauda equina syndrome; true cauda equina syndrome; false cauda equina syndrome; MRI

Introduction

Cauda equina syndrome (CES) is a rare but clinically significant condition comprising of a potential cacophony of symptoms and signs ranging from low back pain to a frank loss of sphincter control.¹ Previous studies and meta-analysis have highlighted the importance of early diagnosis and expedited treatment, as delays are associated with poor outcomes.^{2,3} This can be devastating for the patients and leads to significant financial consequences for the health-care provider in terms of litigation and the ongoing healthcare needs of the patient.

The literature confirms a highly variable pattern of perineal symptoms/signs in patients with sCES, hence MRI is the only way to confirm a diagnosis of tCES.⁴⁻⁷ Given the critical nature of imaging in the diagnostic pathway, the lack of 24/7 locally available MRI is creating a pathway with inappropriate or inadequate referrals and unacceptable delays.⁸

A joint statement from Society of British Neurological Surgeons (SBNS) and British Association of Spinal Surgeons (BASS) recommends urgent MRI scanning at the hospital receiving the patient.⁹ Unfortunately in our experience there has not been any obvious change to imaging and referral patterns. Combining this with the trend towards increasing litigation, it is felt that a defensive approach has been adopted by referring organisations, lowering referral thresholds for cases of suspected cauda equina syndrome (sCES).

Going forward on this we strongly feel the need for a nationally agreed, evidence-based referral pathway in practice. We present our large series and in-depth analysis of the referral pathway to provide strong evidence for a more robust pathway to investigate, diagnose and refer in a timely fashion the cohort of patients who can benefit from urgent surgical intervention.

Patients and methods

This study is a retrospective observational study of all referrals made to a single Neurosurgery department over a period of fourteen months where CES was raised as a possible diagnosis. All adult patients (both male and female) referred as sCES to the neurosurgery department at Hull Royal Infirmary during the period during November 2013 and December 2014, were included (this constituted all referrals available on electronic database at the start of data collection). Only degenerative spinal cases were considered. Details of the referrals were obtained from the departmental electronic referral database. Data analysis was performed using Microsoft Excel 2010 sheets.

The study focused on:

- the **pattern** of perineal symptoms/signs
- the **correlation** of perineal symptoms/signs with radiologically documented cauda equina compression

- the **number of patients** with suspected cauda equina syndrome (sCES) that ultimately required surgical decompression within 48 hours of referral

Management plans were decided by the on call Neurosurgical consultant after review of the clinical presentation and an MRI scan. Once diagnosed, cases of tCES were considered for urgent surgical intervention. Urgent surgical intervention was confirmed if undertaken within 48 hours of referral. We retrospectively also looked at extent of canal compromise in axial imaging of tCES cases using eclipse marker in Agfa IMPAX Client software.

Nature of data and obvious inference from result didn't prompt us to employ any statistical analysis.

Results

During the period from November 2013 till December 2014, 550 degenerative lumbar spine referrals were received. 250 patients, aged 19–89 years, were referred as sCES. Primary care physicians referred 58 patients (23%), district general hospitals referred 122 (49%) and the remaining 70 patients (28%) were referred from the Neurosurgical unit's own hospital (mainly the A&E department).

On clinical assessment 182 patients (73%) had complaints of urinary disturbances in the form of either incontinence or retention of urine and 76 patients (30%) had subjective perineal numbness. 52 patients (21%) had both subjective perineal numbness and urinary disturbance. On examination, 86 patients (34%) had objective alteration in perineal sensation and 63 patients (25%) had disturbed anal sphincter motor function. 39 patients (16%) had both disturbed perineal sensation and disturbed anal sphincter motor function (Figures 1 and 2(a,b)). Evaluation of these clinical findings in patients with tCES vs fCES (Figure 2(a,b)) demonstrates similar figures in the 2 groups. This highlights the limited value of clinical assessment when trying to identify the cases of tCES that require urgent surgery.

Figure 3 shows the outcomes for the cases of sCES. 118 patients (47%) had no significant radiological lesion identified.

98 patients (39%) had radiologically significant disc disease (RSD) without cauda equina compression – mainly unilateral lateral recess/foraminal disc bulges. Only 34 patients (14%) showed cauda equina compression on MRI (rCEC). Retrospective review of canal compromise in rCEC cohort imaging demonstrated 50% or more of canal compromise in all patients. Out of these 34 patients with rCEC, 32 patients (13%) with clinical and radiological cauda equina syndrome (tCES) were considered for urgent surgery and underwent surgical intervention within 48 hours apart from 3 of them with other medical issues requiring optimization before surgery. The remaining 2 cases with radiological compromise but no clinical signs and symptoms of cauda equina syndrome either had early surgery after 48 hours or were deemed unfit/declined surgical intervention.

MRI was delayed to the next day in 60 (82%) of 73 cases who presented out of hours or over the weekend mainly due to lack of availability of MRI services. 13/73 (18%) patients underwent out of hours MRI. 11 (15%) patients were transferred to the Neurosurgical unit for an out of hours MRI scan, whereas 2 (3.0%) had an out of hours MRI at the referring hospital. Of these 13 patients only 1 (8%) was found to be a candidates for urgent surgical intervention.

Discussion

Cauda equina syndrome (CES) is a complex of symptoms and signs, including low back pain, unilateral or bilateral radiculopathy, lower extremity motor weakness, sensory disturbance including saddle anaesthesia, and loss of visceral function (i.e. bladder and bowel incompetence ranging from frequency to bladder and anal sphincter paralysis, and erectile dysfunction), that results from either acute or chronic cauda equina compression.^{1,10} The most frequent cause of CES is a large lower lumbar disc herniation, prolapse or sequestration.¹ CES may also be caused by smaller prolapses in the presence of spinal stenosis.¹¹ Less common causes are epidural haematoma, infections, primary and metastatic neoplasms, traumatic spinal injury, post-surgical

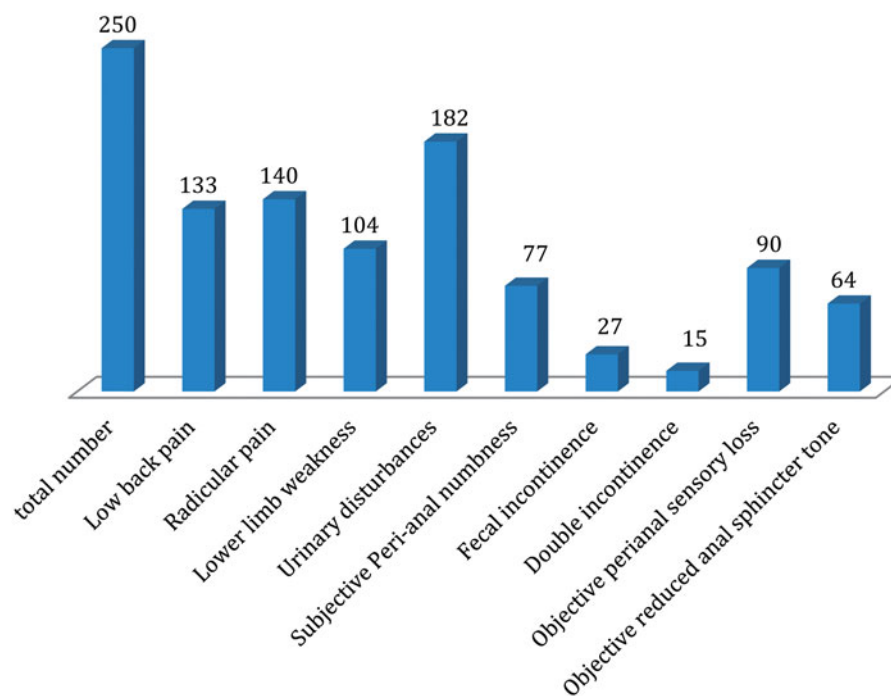


Figure 1. Spectrum of Clinical Presentation.

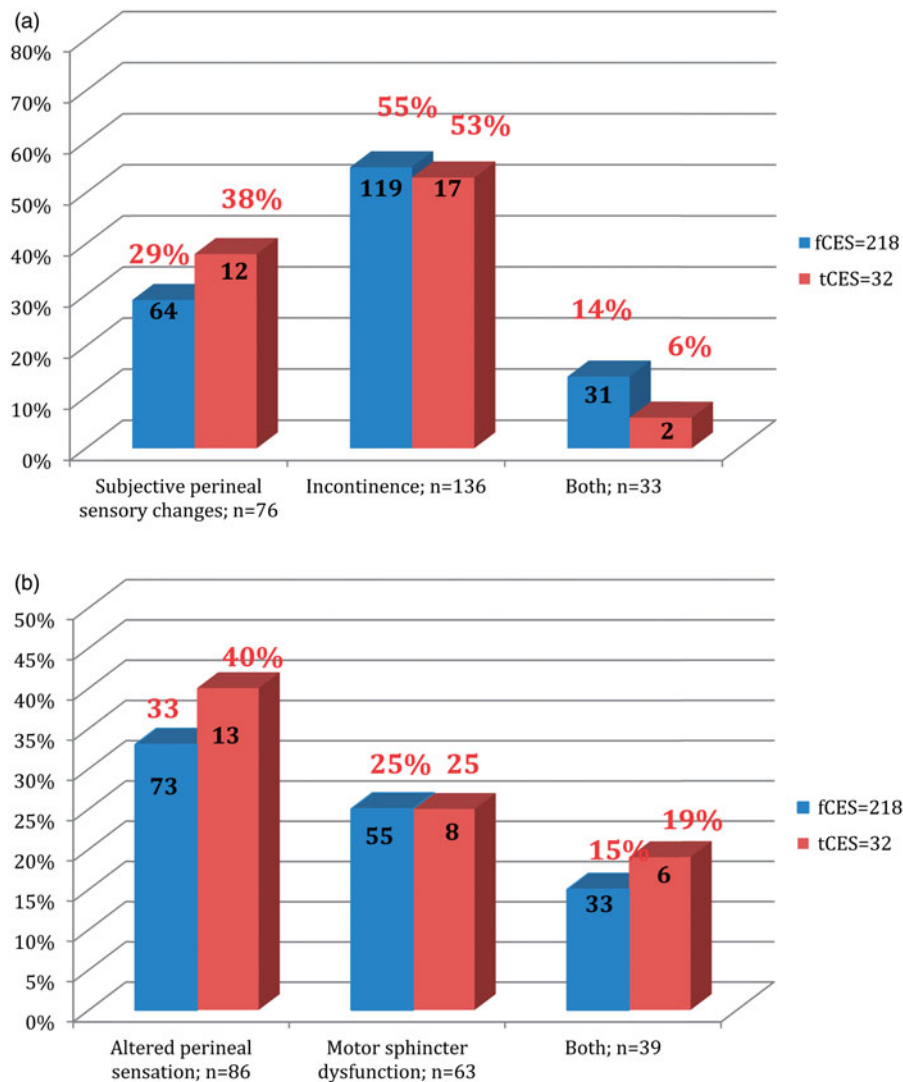


Figure 2 (a) Comparison of perineal symptoms shown in percentage of individual group. (b) Comparison of perineal signs shown in percentage of individual group.

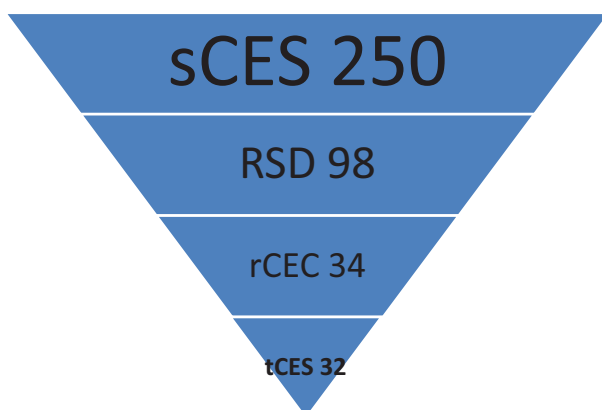


Figure 3. Outcome of clinical and radiological evaluation. sCES: suspected cauda equina syndrome; RSD: radiologically significant disc disease without cauda equina compression; rCEC: radiological cauda equina compression; tCES: true cauda equina syndrome.

and after spinal anaesthesia. However, classical CES is a relatively rare condition with incidence in the population thought to be between 1 in 33,000 to 1 in 100,000.¹² As such most UK general practitioners (GPs) are unlikely to see a case of tCES caused by intervertebral disc herniation in their entire career.¹³ While this

may be considered a rare condition, Hospital Episode Statistics (HES) data¹⁴ recorded 981 CES related operations in England in 2010–2011 (60% neurosurgery, 40% orthopaedics). Over an 8-year period between 2002–2010, the National Health System Litigation Authority (NHSLA) closed 235 claims¹⁵ relating to spinal surgery. 38 of these successful claims in spinal surgery were associated with cauda equina syndrome secondary to a prolapsed intervertebral disc. The mean average damages were £268,515,¹⁵ making CES one of the major causes of litigation in the NHS, both for primary and secondary care. This is not surprising, as a previously fit individual is rendered, in various combinations, and often in perpetuity, incontinent of urine and faeces, with loss of perineal, penile, and vaginal sensation, and major disturbance of sexual function.¹³ Self-catheterisation, chronic back and leg pain are often other long-term sequelae.¹³

Currently the investigation of choice to diagnose CES with confidence is MRI except where specifically contraindicated.⁹ Bell *et al.*⁴ performed a 4 month study on sCES evaluating the diagnostic accuracy of perineal and urinary symptoms. They found these symptoms correlated poorly with a confirmed diagnosis of tCES and thus MRI was critical in the diagnostic pathway. Of note this poor diagnostic accuracy on clinical grounds is independent of the grade or specialty of the assessing doctor – neurosurgeons are no different in their ability to diagnose CES

based purely on clinical findings.⁴ Balasubramanian *et al.*⁵ also assessed the reliability of clinical assessment in diagnosing CES. Similar to our study, they found that only 18.8% of patients were found to have tCES. Saddle sensory deficit was found to have a higher predictive value than other clinical features in diagnosing a CES. However, they concluded that there is no symptom or sign that has an absolute predictive value in establishing the diagnosis of tCES. As such the conclusion was that any patient in whom a reasonable suspicion of CES arises must undergo urgent MRI to exclude this diagnosis. Croker *et al.*,⁶ evaluated a series of 76 patients. Based on the low yield of a positive MRI they recommended early MRI but support waiting till morning if out of hours is not available at the DGH. In our series of 250 patients, urinary and perineal symptoms or signs did not help differentiate tCES from fCES. The diagnosis of tCES in our cohort (13%) is similar to the other published series. Therefore because of the low sensitivity and specificity of the clinical examination in confidently diagnosing CES,^{4,5} and due to high litigation,¹⁵ a large number of patients are referred to regional neurosurgery centres with suspected CES, where definitive spinal services and 'out of hours' facility for MRI is available.^{8,16,17}

Given the evidence to support the importance of early diagnosis, and the evidence to support the role of MRI in the diagnosis of tCES, a national pathway should be designed that allows 24/7 access to the nearest MRI scanner. An analogous situation is the evidence that led to the national initiative and creation of major trauma centres to reduce the delay in the treatment of trauma patients that was leading to poor outcomes. Such a national initiative for the diagnostic pathway for CES will reduce the time from referral to surgical intervention, improving the outcomes leading to lesser long-term health care costs and fewer cases proceeding to litigation. It will also reduce the number of inadequate or inappropriate referrals that may distract the neurosurgical team from patients with treatable pathology. (Although anecdotally the senior author's review of local ENTICE - evaluation of national treatment and investigation of cauda equina - data would suggest that patients with sCES symptoms and a scan confirming no cauda equina compression are still being referred for a Neurosurgical opinion). Therefore, there is a significant opportunity cost here with these inappropriate referrals that can only be addressed by a nationally coordinated pathway with early access to MRI at the referring hospital.

A potential solution was identified in earlier studies. Todd recommends MRI at referring hospital emergently rather than urgently i.e. within one hour of diagnosis of sCES irrespective of the hour or the day.² Hautmfleisch *et al.*⁸ undertook a survey of 234 trusts in England and Wales regarding out of hours MRI provision. 107 responses (45.7%) confirmed only 14% providing 24 hour access; 63% provided extended (20:00) weekday and 81% provided weekend daytime service. To address this they describe a system to provide access to MRI with minimal additional training costs to the organization, by training local CT radiographers to perform out of hours MRIs at the referring hospital (CT being more universally available 24/7 due to national pathways for the early diagnosis of stroke). This had the knock-on benefit of making MRI readily accessible for other time critical conditions such as spinal cord trauma, spinal epidural haematoma/abscess and metastatic cord compression.

Once a diagnosis has been made of tCES, there still remains a lack of consensus regarding the timing of decompressive surgery. Meta-analysis of 322 patients by Ahn *et al.*³ concluded a significant advantage of treating patients within 48 hours. The study was criticised by Kohles *et al.*¹⁸ on statistical grounds for

understating the value of early surgery. Todd,¹⁹ after reviewing 56 human and animal studies of CES concluded that all CES patients should have emergency imaging and emergency treatment to maximise the probability of a good outcome. However, others have argued the importance of identifying patients with reversible neurological impairment. The supposition is that those with urinary retention and overflow incontinence at presentation (CESr) already have an irreversible condition, whereby emergency surgery confers no outcome advantage. Studies²⁰ have also expressed caution for out of hours surgery citing less than optimal conditions (tired, junior staff with non-specialist theatre scrub teams), which may add to rather than alleviate morbidity. Despite this lack of clarity amongst the medical profession regarding the timing of surgery, a study of medicolegal practice²¹ revealed that the majority of CES patients pursuing a legal course did not undergo emergency decompressive surgery, suggesting the courts and legal profession see no ambiguity.

SBNS previous stance on this topic was recorded in 'Standards of Care for Established and Suspected Cauda Equina syndrome' document in 2009.²² There was a recommendation for MRI to be performed locally 'if at all possible'.²² In an attempt at further clarity and a national consensus in 2016 the SBNS and BASS issued a joint statement.⁹ This advised that patients presenting with acute back and/or leg pain, with a suggestion of bladder or bowel disturbance with or without saddle sensory disturbance should be suspected of having CES. This strongly recommends that MRI scanning 'should' be undertaken urgently at the hospital receiving the patient. This is to ensure timely diagnosis and where appropriate, immediate referral and transfer to specialist spinal centre. If cauda equina compression is confirmed, the guidance also advises that decompressive surgery should be performed at the earliest opportunity.

In addition the SBNS care quality statement²³ regarding the management of neurosurgical emergencies emphasises that referring local hospitals should investigate patients thoroughly prior to referral to tertiary Neurosurgical care, stating:

1. Neurosurgical staff should not be considered as a scanning service
2. A diagnosis should be reached prior to referral
3. Out of hours MRI scanning should be considered to be routine practice prior to referral to prevent needless and potentially harmful transport of patients for diagnostic imaging.

Despite this evidence based guideline and national recommendation from BASS and the SBNS there is an increasing trend of referrals of sCES without imaging. In current climate there is a general apprehension regarding sCES referrals to neurosurgical services without MRI and with delays at local hospitals and this puts neurosurgeons in a moral and legal dilemma. A study²⁴ presented by this team at the spring 2017 SBNS conference by revealed that 19/27 (70%) of Neurosurgical centres are still regularly assessing patients with sCES prior to definitive imaging. At present we therefore have a situation nationally where highly specialised tertiary services are providing their own triage service with the prospect of a very low positive diagnosis rate of around 1 in 7 (15%), instead of providing care for patients with treatable neurosurgical pathology.

This study has identified that patients with sCES have a highly variable pattern of perineal symptoms/signs. Poor correlation between perineal symptoms/signs and radiological cauda equina compression was also identified. This means that amongst the large number of patients referred with sCES, only a small percentage had true cauda equina syndrome (tCES) and ended up

with urgent surgical treatment. Given that MRI is the only way to confirm a diagnosis of CES, we recommend a nationally agreed policy mandating availability of out of hours MRI services at district hospitals where MRI is available during normal working hours. This would prevent unnecessary inter-hospital transfers, avoiding costly delays and a creating a patient pathway that is more acceptable to the patient and in keeping with the NHS ethos of managing patients as close to their home as possible.

Our study also highlights the potential for a sizeable financial and logistical burden of sCES, and a potential opportunity cost as the majority of cases (87%) consume resources (manpower, ambulance transfers, beds and diagnostics) without any resulting intervention. These fCES cases then appear to get stuck on an expensive, inefficient inpatient investigative pathway instead of being discharged for outpatient investigation as no emergency pathology has been identified.

In addition guidelines outlining the management of the patients with fCES need to be tailored so that these patients have expedited review with the acute pain management service, psychological and social support, with early discharge and appropriate follow up. Reducing the hospital stay for fCES cases will again have financial benefits for the NHS and will lead to improved patient satisfaction as they avoid prolonged inpatient stays with its inherent frustrations. NHS England's 'sustainability and transformation plan' which aims to utilise resources more efficiently and reduce dependence to Hospitals could be an appropriate platform to review this pathway.²⁵

Conclusion

Management of tCES requires emergency surgery in a tertiary setting. Management of patients with fCES does not. This study demonstrates that the vast majority of patients referred with sCES do not have tCES. Transferring them to a regional Neurosurgical unit for investigation therefore wastes limited resources and represents a potential saving to the NHS. This depends on the creation of a more appropriate pathway that would improve access to out of hours MRI. The cost of up skilling CT radiographers or employing additional MRI radiographers to cover such a rota is less than the cost implications of transferring the patients to tertiary units for triage. The proposed changes will also improve the efficiency of the diagnostic pathway and improve the patient experience for both the tCES and the fCES patients as they are scanned at an earlier stage at their local hospital. A National policy on providing 24/7 MRI in DGHs for these cases is long overdue. The National Health Service's 'sustainability and transformation partnership plan' could be an appropriate platform to achieve this objective. After all, given it is now an accepted national standard that referrals for an elective neurosurgical opinion should be accompanied by appropriate imaging, isn't it time we expected the same for emergency referrals?

Disclosure statement

None of the authors have any financial interests relevant to this paper.

References

- Fehlings MG, Zeidman SM, Neilank Jha Y, Rampersaud R. Cauda equina syndrome. In: Edward C, Benzel, MD, eds. *Spine surgery: techniques, complication avoidance and management*. 3rd ed. Philadelphia: Elsevier; 2012.
- Todd NV. Cauda equina syndrome: is the current management of patients presenting to district general hospitals fit for purpose? A personal view based on a review of the literature and a medicolegal experience. *Bone Joint J* 2015;97-B:1390-4.
- Ahn UM, Ahn NU, Buchowski MS, Garrett ES, Sieber AN, Kostuik JP. Cauda equina syndrome secondary to lumbar disc herniation. A meta-analysis of surgical outcomes. *Spine* 2000;25:1515-22.
- Bell DA, Collie D, Statham PF. Cauda equina syndrome: what is the correlation between clinical assessment and MRI scanning? *Br J Neurosurg* 2007;21:201.
- Balasubramanian K, Kalsi P, Greenough CG, Kuskoor Seetharam MP. Reliability of clinical assessment in diagnosing cauda equina syndrome. *Br J Neurosurg* 2010;24:383-6.
- Crocker M, Fraser G, Boyd E, Wilson J, Chitnavis BP, Thomas NW. The value of interhospital transfer and emergency MRI for suspected cauda equina syndrome: a 2-year retrospective study. *Ann R Coll Surg Engl* 2008;90:513-6.
- Ahad A, Elsayed M, Tohid H, Neuroradiol J. The accuracy of clinical symptoms in detecting cauda equina syndrome in patients undergoing acute MRI of the spine. *Neuroradiol J* 2015;28:438-42.
- Hauptfleisch J, Meagher TM, King D, López de Heredia L, Hughes RJ. Out-of-hours MRI provision in the UK and models of service delivery. *Clin Radiol* 2013;68:e245-8.
- Society of British Neurological Surgeons Standards of Care for Suspected and Confirmed Compressive Cauda Equina Syndrome. 2016. Available from: <http://www.sbns.org.uk/index.php/policies-and-publications> [last accessed Jul 2017].
- Domen PM, Hofman PA, Van Santbrink H, Weber WEJ. Predictive value of clinical characteristics in patients with suspected cauda equina syndrome. *Eur J Neurol* 2009;16:416-9.
- Shapiro S. Cauda equina syndrome secondary to lumbar disc herniation. *Neurosurgery* 1993;32:743-6.
- Anthony S. Cauda equina syndrome. *Med Protect Soc UK Casebook* 2000;20:9-13.
- Lavy C, James A, Wilson-MacDonald J, Fairbank J. Cauda equina syndrome. *BMJ* 2009;338:b936.
- The National Spinal Taskforce. Commissioning spinal services: getting the service back on track. A guide for commissioners of spinal services. Available from: <http://bit.ly/1EcUArf> [last accessed Jul 2017].
- Quraishi NA, Hammett TC, Todd DB, Bhutta MA, Kapoor V. Malpractice litigation and the spine: the NHS perspective on 235 successful claims in England. *Eur Spine J* 2012;(Suppl 2):S196-S9.
- Deniz K, Spink GM, Anand A, Brecknell JE, Peterson D. Have I got cauda equina syndrome? Which presenting symptoms best predict a positive scan? Oral presentation at 150th meeting of the Society of British Neurological Surgeons, Novotel Hammersmith, London. *Evid Based Spine Care J* 2011;2:27-33.
- Lee MB, Rooney A, Statham PFX. A retrospective audit on the management of referrals for impending cauda equina syndrome. Oral presentation at 150th meeting of the Society of British Neurological Surgeons, Novotel Hammersmith, London. *Br J Neurosurg* 2007;21:91-179.
- Kohles SS, Kohles DA, Karp AP, Erlich VM, Polissar NL. Time-dependent surgical outcomes following cauda equina syndrome diagnosis: comments on a meta-analysis. *Spine (Phila PA 1976)* 2004;29:1281-7.
- Todd NV. Neurological deterioration in cauda equine syndrome is probably progressive and continuous. Implications for clinical management. *Br J Neurosurg* 2015; 29: 630-4.
- Gleave JR, Macfarlane R. Cauda equina syndrome: what is the relationship between timing of surgery and outcome? *Br J Neurosurg* 2002;16:325-8.
- Todd NV. Causes and outcomes of cauda equina syndrome in medicolegal practice: a single neurosurgical experience of 40 consecutive cases. *Br J Neurosurg* 2011; 25:503-8.
- Standards of Care for Established and Suspected Cauda Equina Syndrome. 2009. Available from: http://www.sbns.org.uk/index.php/download_file/view/131/87 [last accessed Sept 2017].
- Society of British Neurological Surgeons Care Quality Statement, 2015. Available from: <http://www.sbns.org.uk/index.php/policies-and-publications> [last accessed Jul 2017].
- Razak A, Hassan S, Brown D, Hussain M. Who 'owns' suspected Cauda equina patients? Oral presentation at spring 2017 meeting of the Society of British Neurological Surgeons, Oxford. *Br J Neurosurgery* 2017;31:119-58.
- National Health Service. Sustainability and transformation partnership. Available from: <https://www.england.nhs.uk/stps/> [last Accessed Jul 2017].