

Nerve root injection cancellations because of incomplete anticoagulation management

ABSTRACT

Background: Computed tomography-guided steroid injection is a well-recognized, conservative treatment of localized spinal pain as a result of facet arthropathy and radiculopathy secondary to nerve root compression. An extremely rare complication is the development of an epidural haematoma with potential to cause permanent neurological damage, so anticoagulation at the time of procedure is contraindicated. Routinely injections are performed as an outpatient requiring the referring physician to implement a peri-procedural anticoagulation plan. Anecdotal experience suggested that cancellations were occurring as patients remained on anticoagulation at the time of their appointment. The authors therefore assessed the existing service against expected standards to identify the causes of cancellations and find ways to improve the service.

Aims: This audit aimed to identify the incidence of cancelled computed tomography-guided nerve root injections secondary to incorrect peri-procedural anticoagulation management, develop an intervention to help reduce the incidence of cancellations and then re-audit to assess the effect of the intervention.

Methods: The audit standard was that 100% of outpatients attending for computed tomography-guided nerve root and facet injections should have an appropriate anticoagulation plan implemented. Baseline data collection took place prospectively between 1 September and 30 November 2016. The study population was elective computed tomography-guided spinal nerve root and facet injections scheduled on the radiology information system at the authors' trust. Descriptive analysis was completed. The intervention involved a revised electronic request form being implemented with new compulsory fields concerning antiplatelets and anticoagulants. Re-audit post-intervention involved prospective data collection between 1 September and 30 November 2017 using the same methods.

Results: Baseline audit found that of three out of 55 (5%) patients had cancellations. On re-audit, there were 0 cancellations out of 93 patients.

Conclusions: The new request form prevented 5% of patients referred for computed tomography-guided nerve root injection being cancelled because of incorrect anticoagulation management. Extrapolated over the year the potential savings through preventing lost activity are £3445.56.

management, and re-audit to assess the effect of the intervention on the cancellation rate of computed tomography-guided spinal injections secondary to incorrect peri-procedural management.

Methods

Audit standard

It is expected that 100% of outpatients attending for a computed tomography-guided nerve root injection should have an appropriate anticoagulation plan implemented. The requesting clinician is responsible for ensuring an appropriate plan is in place.

Data collection

To quantify the existing problem, baseline data were collected prospectively between 1 September and 30 November 2016 on all elective computed tomography-guided spinal nerve root injections scheduled on the computerised radiology information system (CRIS). The age, gender, scheduled procedure and whether the procedure was cancelled secondary to incorrect peri-procedural anticoagulation management was noted for each patient. Requesting clinicians were not specifically made aware of the ongoing audit to limit deviation from current normal practice.

Computed tomography-guided steroid injection is a well-recognized, conservative treatment of localized spinal pain and radiculopathy (Boswell et al, 2007; Benny and Azari, 2011). Development of an epidural haematoma is an extremely rare complication which can cause permanent neurological damage (Jankowski, 2002). Anticoagulants have been associated with nearly a quarter of cases of epidural haematomas (Jankowski, 2002), so implementation of an appropriate peri-procedural anticoagulation plan is essential. Computed tomography-guided nerve root injections are routinely performed on an outpatient basis requiring the referring physician to pre-assess the patient, including implementing anticoagulation plans.

Local guidance indicates that anticoagulation at the time of the procedure is an absolute contraindication. Anecdotal experience at the authors' trust suggested that procedures were being cancelled as patients had no anticoagulation plan and remained on their anticoagulation at the time of their appointment. This was causing distress to patients and clinicians and wasting resources.

Aims

The initial aim was to identify the incidence of cancelled computed tomography-guided spinal injections secondary to incorrect peri-procedural anticoagulation management. The team would then develop an intervention that would help reduce the incidence rate of cancelled procedures secondary to incorrect peri-procedural anticoagulation

Dr Elizabeth Robinson, Foundation Year 2 Doctor, Department of Radiology, Guy's and St Thomas' Foundation Trust, London SE1 7EH

Dr Shahab Shahipasand, Foundation Year 2 Doctor, Department of Radiology, London North West Healthcare NHS Foundation Trust, London

Mr Panagiotis Liantis, Consultant Orthopaedic Surgeon, Department of Orthopaedics, Guy's and St Thomas' Foundation Trust, London

Dr Ramin Mandegaran, Specialist Registrar in Radiology, Department of Radiology, Guy's and St Thomas' Foundation Trust, London

Dr Ali Zavareh, Consultant Radiologist, Department of Radiology, Guy's and St Thomas' Foundation Trust, London

Correspondence to: Dr E Robinson (elizabeth.robinson@doctors.org.uk)

Descriptive analysis was completed analysing the incidence of nerve root injection cancellations secondary to incorrect peri-procedural anticoagulation management and the percentage compliance with the expected standard.

Ethical approval

This study was an observational service evaluation without deviation from normal practice, performed with local audit approval and in accordance with clinical governance guidelines. Formal research ethics committee approval was not required.

Intervention

Following the initial audit of current practices, a revised electronic request form was implemented (*Figure 1*). This incorporated new compulsory fields to be completed including specifying whether the patient is on any anticoagulant or antiplatelet therapy and, if so, whether an alternative peri-procedural anticoagulation plan had been implemented.

A short presentation was given at local multidisciplinary team meetings involving the relevant referring specialties

(orthopaedics, rheumatology, pain team) in order to make referring clinicians aware of the intervention.

Re-audit following intervention

Following implementation of the new request form, data were again prospectively collected over an identical time period the following year; between 1 September and 30 November 2017. The same data collection methods were used.

Results

Baseline audit

A total of 55 patients were scheduled to undergo computed tomography-guided nerve root injection (median age 54 years, 32 men, 23 women). Three cancellations occurred secondary to incorrect peri-procedural anticoagulation management: two patients remained on warfarin and one remained on aspirin and clopidogrel. Before any intervention, 5% (3/55) of all scheduled computed tomography-guided nerve root injections were cancelled as a result of incorrect peri-procedural anticoagulation management.

Re-audit following intervention

A total of 93 patients were scheduled to undergo computed tomography-guided nerve root injection (median age 54 years, 51 men, 42 women). The incidence of cancellations was reduced to 0% (0/93) secondary to incorrect peri-procedural anticoagulation management despite a significant increase in the number of scheduled computed tomography-guided nerve root injections over the same period of time.

Discussion

Image-guided spinal procedures carry an inherent risk of bleeding and spinal haematoma because of the need to place the needle close to the spinal vasculature (Layton et al, 2006). The association of anticoagulants and the occurrence of an epidural haematoma following spinal nerve root injection is well established (Swerdlow, 1982; Jankowski, 2002; Xu et al, 2009). While the incidence of such events is rare, estimated between 1 in 150 000 and 1 in 222 000 (Horlocker et al, 2010), the consequences can be devastating (Lee et al, 2007). As such local guidance and patient information given in trusts nationwide has been to implement appropriate bridging or temporary cessation of antiplatelet and anticoagulant therapy to mitigate this risk before a nerve root injection. There are no consensus national guidelines regarding the most appropriate peri-procedural bridging anticoagulation plan specific to image-guided spinal injections. However, the Society of Interventional Radiology has advocated:

1. Withholding clopidogrel 5 days before the procedure
2. Not to withhold aspirin
3. For international normalized ratio to be corrected to <1.5 (Patel et al, 2012).

With a lack of national consensus over the most appropriate peri-procedural plan, appropriate local guidance must be implemented and adhered to.

Some patients are at increased risk for arterial or venous thromboembolism if anticoagulation is temporarily ceased. These high risk groups include patients with metallic cardiac valves, those who have had a recent stroke or transient ischaemic attack within the last 6 months, patients who have had a recent pulmonary emboli or deep vein thrombosis (in the last 3 months), patients who have thrombophilia (e.g. protein C and

Figure 1. Section of new order form for computed tomography-guided nerve root injection. Highlighted in red are the new fields required to be completed by the requesting clinician. These include whether the patient is on aspirin, clopidogrel, warfarin or other anticoagulant and, if so, whether alternative plans have been made for the procedure.

S deficiencies)(Atwell et al, 2017). Bridging with low molecular weight heparin, heparin or fondaparinux may be necessary in such patients (Douketis et al, 2008). In cases of high thromboembolic risk the referring clinician should seek advice from a haematologist to guide specific anticoagulation management where routine local guidance is not applicable. Local guidance may not have clear instructions about newer antithrombotic agents such as dabigatran and rivaroxaban, reflecting the paucity of quality evidence surrounding their use in the context of invasive procedures such as spinal injections (Manchikanti et al, 2013). Ultimately, radiology and haematology input should be sought early whenever there is any doubt regarding the specific bleeding risks of a procedure or appropriate anticoagulation bridging plan.

Computed tomography-guided nerve root injections are predominantly delivered on an outpatient basis, so the referring clinician must recognize the patient's current antiplatelet or anticoagulant therapy and put in place an appropriate peri-procedural management plan. The baseline data showed that on occasion this was being overlooked, not followed through by referrers or there was confusion as to whether it was the responsibility of the radiologist performing the procedure rather than the referring clinician. A logical first intervention was to develop a new request form, prompting the referring clinician to consider the patient's anticoagulation and specify a plan. This simple, low-cost intervention reduced the incidence of on-the-day cancellations from 5% to 0%. This is perhaps even more significant given the increased departmental activity between the two periods evaluated, with a near doubling in scheduled injections (55 at baseline to 93 in the re-audit period) following introduction of a new injection list for further capacity. If these findings were extrapolated over a year, with departmental activity continuing at the same level, the simple new request form could potentially save 20 procedures from being cancelled with a conservative estimate of savings to the trust through reducing lost activity of £3445.56.

A new request form prompting consideration of peri-procedural anticoagulation management has wider potential applications in many routine invasive hospital procedures. It is particularly pertinent for radiologically-guided interventions (e.g. liver, lung and renal

biopsies, biliary interventions, selective blocks and drain placement, angiographic studies) as well as endoscopic procedures since the patient is often unknown to the interventionalist or endoscopist before the day of the procedure. In such instances the referrer must balance the haemorrhagic risk from the procedure against the risk of thrombotic complications. A request form like this prompting a check of patient anticoagulation could readily be adopted for other invasive procedures to prompt early consideration of these medications and forward planning to prevent on-the-day cancellations.

Conclusions

In the absence of national guidance regarding the peri-procedural management of antiplatelets and anticoagulation, local guidance must be followed. Evidence from the authors' trust indicated that 5% of computed tomography-guided nerve root injections were previously being cancelled on the day as a result of failure to implement an appropriate anticoagulation plan. A simple modification to the electronic request form for computed tomography-guided nerve root injections prompted the referrer to consider the patient's anticoagulation or antiplatelet therapy and implement an appropriate management plan. This simple intervention reduced the cancellation rate to 0%. This in turn has resulted in significant savings for the trust, with an increased throughput of patients undergoing nerve root injections and reduced waiting times. This approach can be easily replicated in other trusts and in different services. **BJHM**

Conflict of interest: none.

- Atwell TD, Wennberg PW, McMenomy BP, Murthy NS, Anderson JR, Kriegshauser JS, McKinney JM. Peri-procedural use of anticoagulants in radiology: an evidence-based review. *Abdominal Radiology*. 2017 May;42(5):1556–1565. <https://doi.org/10.1007/s00261-016-1027-x>
- Benny B, Azari P. The efficacy of lumbosacral transforaminal epidural steroid injections: A comprehensive literature review. *J Back Musculoskeletal Rehabil*. 2011 May 16;24(2):67–76. <https://doi.org/10.3233/BMR-2011-0279>
- Boswell MV, Trescot AM, Datta S et al; American Society of Interventional Pain Physicians. Interventional techniques: evidence-based practice guidelines in the management of chronic spinal pain. *Pain Physician*. 2007 Jan;10(1):7–111.
- Douketis JD, Berger PB, Dunn AS, Jaffer AK, Spyropoulos AC, Becker RC, Ansell J. The perioperative management of antithrombotic therapy. *Chest*. 2008 Jun;133(6) Suppl:299S–339S. <https://doi.org/10.1378/chest.08-0675>

KEY POINTS

- There is no national guidance regarding the peri-procedural management of antiplatelet and anticoagulation medications in the context of image-guided musculoskeletal procedures, so local guidance must be followed.
- A simple modification to the request form of computed tomography-guided nerve root injections prompts the referrer to consider if the patient is on any anticoagulation or antiplatelet therapy. This helps with implementation of an appropriate anticoagulation plan and can save up to 5% of procedures being cancelled on the day.
- This simple modification could save a trust significant money through reducing lost activity.

- Horlocker TT, Wedel DJ, Rowlingson JC et al. Regional anesthesia in the patient receiving antithrombotic or thrombolytic therapy: American Society of Regional Anesthesia and Pain Medicine evidence-based guidelines (third edition). *Reg Anesth Pain Med*. 2010 Jan-Feb;35(1):64–101. <https://doi.org/10.1097/AAP.0b013e3181c15c70>
- Jankowski CJ. 2002. Complications of regional anaesthesia. In: Raj PP, ed. *Textbook of Regional anaesthesia*. New York, NY; Churchill Livingstone:829–852
- Layton KF, Kallmes DF, Horlocker TT. Recommendations for anticoagulated patients undergoing image-guided spinal procedures. *AJNR Am J Neuroradiol*. 2006 Mar;27(3):468–470.
- Lee JY, Nassr A, Ponnappan RK. Epidural hematoma causing paraplegia after a fluoroscopically guided cervical nerve-root injection. A case report. *J Bone Joint Surg Am*. 2007 Sep;89(9):2037–2039. <https://doi.org/10.2106/00004623-200709000-00021>
- Manchikanti L, Falco FJ, Benyamin RM et al. Assessment of bleeding risk of interventional techniques: a best evidence synthesis of practice patterns and perioperative management of anticoagulant and antithrombotic therapy. *Pain Physician*. 2013 Apr;16(2 Suppl):SE261–318.
- Patel IJ, Davidson JC, Nikolic B, Salazar GM, Schwartzberg MS, Walker TG, Saad WA; Standards of Practice Committee, with Cardiovascular and Interventional Radiological Society of Europe (CIRSE) Endorsement. Consensus guidelines for periprocedural management of coagulation status and hemostasis risk in percutaneous image-guided interventions. *J Vasc Interv Radiol*. 2012 Jun;23(6):727–736. <https://doi.org/10.1016/j.jvir.2012.02.012>
- Swerdlow M. Medico-legal aspects of complications following pain relieving blocks. *Pain*. 1982 Aug;13(4):321–331. [https://doi.org/10.1016/0304-3959\(82\)90001-X](https://doi.org/10.1016/0304-3959(82)90001-X)
- Xu R, Bydon M, Gokaslan ZL, Wolinsky JP, Witham TE, Bydon A. Epidural steroid injection resulting in epidural hematoma in a patient despite strict adherence to anticoagulation guidelines. *J Neurosurg Spine*. 2009 Sep;11(3):358–364. <https://doi.org/10.3171/2009.3.SPINE0916>