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**Prise en charge peropératoire de la douleur lors d'une
laminectomie : revue de la littérature et
recommandations du groupe PROSPECT = Pain
management after laminectomy : a systematic review
and procedure-specific postoperative pain management
(PROSPECT) recommendations**

Pauline Le Cacheux

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**UNIVERSITE
BRETAGNE
LOIRE**

THÈSE D'EXERCICE / UNIVERSITÉ DE RENNES 1
sous le sceau de l'Université Bretagne Loire

Thèse en vue du

DIPLÔME D'ÉTAT DE DOCTEUR EN MÉDECINE

présentée par

Pauline LE CACHEUX

Née le 27/04/1992 à Paris

**Prise en charge peropératoire
de la douleur lors d'une
laminectomie : revue de la
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**Pain management after
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**Thèse soutenue à Rennes
le 2 avril 2021**

devant le jury composé de :

Claude ECOFFEY
PU-PH Rennes / *Président du jury*

Patricia LAVAND'HOMME
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Xavier MORANDI
PU-PH Rennes / *Membre du jury*

Simon VIQUESNEL
PH Rennes / *Membre du jury*

Lotfi HATTOU
PH Rennes / *Membre du jury*

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Figure 1. PRISMA Flowchart

Table 1. Overall recommendations for perioperative pain management in patients undergoing lumbar laminectomy

Table 2. Analgesic interventions that are not recommended for pain management in patients undergoing lumbar laminectomy

Supplementary Table 1. Quality assesment assigned to the randomized controlled trials that were included in the review for perioperative pain management in patients undergoing lumbar laminectomy (n = 39)

Supplementary Table 2. Summary of key results from studies evaluating systemic analgesics, systemic analgesic adjuncts and regional analgesia used to support the recommended interventions in patients undergoing lumbar laminectomy.

Supplementary Table 3. Summary of key results from studies evaluating systemic analgesics, systemic analgesic adjuncts and regional analgesia that are not recommended interventions in patients undergoing lumbar laminectomy

RESUMÉ

Objectif: La laminectomie lombaire étant de plus en plus pratiquée en ambulatoire, une gestion adaptée de la douleur est essentielle pour diminuer les délais de séjour des patients et éviter une réadmission précoce en hospitalisation. Notre objectif était d'évaluer la littérature disponible à ce sujet et d'élaborer des recommandations pour une prise en charge optimale de la douleur après une laminectomie lombaire à un ou deux niveaux.

Méthodes: Une revue systématique a été entreprise utilisant la méthodologie PROSPECT (PROcedure SPECific Postoperative Pain Management). Des essais contrôlés randomisés (ECR) publiés en anglais du 1er janvier 2008 au 31 mars 2020 - évaluant l'impact d'interventions analgésiques, anesthésiques ou chirurgicales sur la douleur postopératoire - ont été identifiés à partir des bases de données MEDLINE, EMBASE et Cochrane.

Résultats: Sur 65 études éligibles identifiées, 39 ECR répondaient aux critères d'inclusion. Le schéma analgésique pour la laminectomie lombaire devrait probablement inclure du paracétamol et un anti-inflammatoire non stéroïdien (AINS) ou un inhibiteur sélectif de la cyclooxygénase (COX) -2 administrés en préopératoire ou peropératoire et poursuivis en postopératoire. Les opioïdes peuvent être utilisés en dernier recours. De plus, une instillation chirurgicale de la plaie ou une infiltration avec des anesthésiques locaux avant la fermeture de la plaie est recommandée. Certaines interventions - gabapentinoïdes et administration intrathécale d'opioïdes -, bien qu'efficaces, comportent des risques importants et ne font pas conséquent par partie des recommandations. D'autres interventions n'étaient pas non plus recommandées en raison d'une insuffisance, d'une incohérence ou d'un manque de preuves.

Conclusion: La gestion de la douleur périopératoire pour la laminectomie lombaire doit inclure le paracétamol et les AINS ou inhibiteurs sélectifs de la COX-2, poursuivis pendant la période postopératoire, ainsi que l'instillation ou l'infiltration chirurgicale peropératoire de la plaie. Les opioïdes doivent être utilisés comme médicaments de secours après l'opération. Des études futures sont nécessaires pour évaluer l'efficacité de nos recommandations.

ABSTRACT

Purpose: With lumbar laminectomy increasingly being performed on an outpatient basis, optimal pain management is critical to avoid postoperative delay in discharge and readmission. The aim of this review was to evaluate the available literature and develop recommendations for optimal pain management after one or two-level lumbar laminectomy.

Method: A systematic review utilizing the PROCEDURE SPECIFIC Postoperative Pain Management (PROSPECT) methodology was undertaken. Randomised controlled trials (RCTs) published in the English language from 1 January 2008 until 31 March 2020 – assessing postoperative pain using analgesic, anaesthetic, and surgical interventions – were identified from MEDLINE, EMBASE and Cochrane Databases.

Results: Out of 65 eligible studies identified, 39 RCTs met the inclusion criteria. The analgesic regimen for lumbar laminectomy should include paracetamol and a nonsteroidal anti-inflammatory drug (NSAID) or cyclooxygenase (COX)–2 selective inhibitor administered preoperatively or intraoperatively and continued postoperatively, with postoperative opioids for rescue analgesia. In addition, surgical wound instillation or infiltration with local anaesthetics prior to wound closure is recommended. Some interventions – gabapentinoids and intrathecal opioid administration –, although effective, carry significant risks and consequently were omitted from the recommendations. Other interventions were also not recommended because there was insufficient, inconsistent or lack of evidence.

Conclusion: Perioperative pain management for lumbar laminectomy should include paracetamol and NSAID or COX-2 selective inhibitor, continued into the postoperative period, as well as intraoperative surgical wound instillation or infiltration. Opioids should be used as rescue medication postoperatively. Future studies are necessary to evaluate the efficacy of our recommendations.

CONTEXT

Recommendations

1. Combination of paracetamol and a non-steroidal anti-inflammatory drug (NSAID) or a cyclooxygenase (COX) –2 selective inhibitor administered preoperatively or intra-operatively and continued postoperatively.
2. Surgical wound instillation or infiltration with local anaesthetics just prior to wound closure.
3. Opioids as rescue analgesia in the postoperative period.

Why was this guideline developed?

Lumbar laminectomy is associated with significant postoperative pain. Adequate pain control will improve outcomes and patient satisfaction. We aim to provide evidence-based recommendations for clinicians to enhance perioperative pain management in patients undergoing lumbar laminectomy.

What other guidelines statements are available on this topic?

While there are systematic reviews available for perioperative pain management in spine surgery, they are not specific for lumbar laminectomy surgery. Thus, there are no formal guidelines specifically for this procedure.

How does this guideline differ from existing guidelines?

There are no previous recommendations. An updated PROSPECT approach was used to develop the current recommendations such that the available evidence is critically assessed for current clinical relevance and the use of simple, non-opioid analgesics such as paracetamol and non-steroidal anti-inflammatory drugs as basic analgesics.

Why does this statement differ from existing guidelines?

This approach reports true clinical effectiveness by balancing the invasiveness of the analgesic interventions and the degree of pain after surgery, as well as balancing efficacy and adverse effects.

INTRODUCTION

Lumbar laminectomy is commonly performed in patients with lumbar spinal stenosis to relieve low back pain, reduce radiculopathy and improve overall function. These procedures are increasingly performed in an ambulatory or day-care setting. Inadequate pain management is one of the main reasons for delayed discharge or readmission after surgery. [1 – 4] Effective pain control improves postoperative outcomes and patient satisfaction. Multimodal analgesia has frequently been recommended for enhanced recovery after surgery. [5] However, a lack of procedure-specific recommendations has resulted in heavy reliance on opioid medications [6]. Efforts to reduce opioid consumption and their associated adverse effects have been recently promoted [7].

The PROSPECT (PROcedure SPECific Postoperative Pain Management) Working Group is a collaboration of surgeons and anaesthesiologists working to formulate procedure specific recommendations for pain management after common but potentially painful operations. The recommendations are based on procedure-specific evidence as well as the balance between the efficacy and adverse effects of analgesic techniques and clinical relevance [8, 9].

The aim of this systematic review was to evaluate the available evidence on the management of pain after lumbar laminectomy. Postoperative pain outcomes (pain scores and analgesic requirements) were the primary focus, but other recovery outcomes – including adverse effects – were also assessed, when reported, and the limitations of the data were critically reviewed. The ultimate aim was to develop recommendations for pain management after laminectomy.

METHODS

A systematic review of literature associated with analgesia after lumbar laminectomy was conducted in accordance with the PROSPECT methodology [9].

Research question

'How can we enhance perioperative pain management in patients undergoing lumbar laminectomy?'

Eligibility criteria

Inclusion criteria were randomized control trials (RCTs) or systematic reviews of analgesic, anaesthetic and operative interventions, published in the English language assessing pain management for patients undergoing up to two-level lumbar laminectomy. The study was required to measure pain intensity using tools such as the numerical rating scale or visual analogue scale. Studies that reported data pooled from patients undergoing mixed surgical procedures were excluded if no response was received from the authors to provide data tables specifically related to laminectomy and the intended intervention. Only open procedures were deemed eligible, minimal invasive procedures were therefore excluded.

Search strategy

EMBASE, MEDLINE, Pubmed and Cochrane Databases (Cochrane Central Register of Controlled Trials, Cochrane Database of Abstracts or Reviews of Effects, Cochrane Database of Systematic Reviews) were searched for studies published between January 1, 2008 and March 31, 2020.

Search terms related to pain and interventions for laminectomy AND pain OR pains OR pain management OR postoperative pain OR post-operative pain OR analgesia* OR anaesthesia* OR vas OR visual analog* OR vrs OR verbal rating scale* OR nrs OR numerical rating scale* OR pain rating OR epidural OR neuraxial OR intrathecal OR paravertebral OR spinal OR infiltration OR nerve block* OR neural block* OR paravertebral block* OR field block* OR Ilioinguinal block* OR transversus abdominis plane block* OR tap block* OR NSAID* OR nonsteroidal anti-inflammatory* OR non-steroidal anti-inflammatory* OR COX-2 OR Paracetamol OR acetaminophen OR clonidine OR opioid* OR ketamine OR corticosteroid* OR gabapentin OR pregabalin.

Study selection

A stepwise manner was used, which included screening of abstracts of potential articles. This process was undertaken by two reviewers and the final results of each reviewer were compared. Any discrepancies between results were discussed within the working group and a decision was made on inclusion or exclusion by consensus.

Assessment of the quality of evidence

The final articles were assessed by all authors and again any discrepancies were resolved in the same fashion. Reasons for exclusion were provided for all articles that were excluded in this phase. Reference lists of the relevant articles were individually screened to assess for any additional articles that may have been missed in the initial literature search. Criteria employed in the assessment of the quality of eligible studies (Supplementary Table 1) included allocation concealment (A – adequate; B – Unclear; C – inadequate; D – not used); the numerical (1–5) quality scoring system employed by Jadad to assess randomisation, double blinding and flow of patients; a participant follow-up of greater or less than 80 percent; and whether the study met the requirements of the Consolidated Standards of Reporting Trials (CONSORT) 2010 Statement.

Data extraction

Summary information for each included study was extracted and recorded in data tables. This information included timing of the intervention and mode of delivery, pain scores, whether pain were assessed at rest or during mobilisation, supplementary analgesic use, time to first analgesic administration, time intervals of pain measured. Unless specified otherwise, it was assumed that the pain scores were assessed at rest. The included studies were grouped together based upon the analgesic interventions (e.g., paracetamol, non-steroidal anti-inflammatory drugs [NSAIDs], gabapentinoids [pregabalin and gabapentin] and locoregional analgesia among others). The study assessing the effects of surgical techniques on analgesic outcomes was grouped separately.

Pain intensity scores were used as primary outcome measures. We defined a difference in pain scores of >10mm/100mm as clinically relevant. The effectiveness of each intervention for each outcome was evaluated qualitatively, by assessing the number of studies showing a significant difference between treatment arms ($P < 0.05$, as reported in the study publication).

A meta-analysis was not performed due to the limited number of studies with homogenous design and differences in reporting of results, restricting pooled analysis.

Formulation of the recommendations

Recommendations are given when at least two congruent studies support an intervention. The proposed recommendations were sent to the PROSPECT Working Group for review and comments. A modified Delphi approach was utilised, which included several rounds of individual comments followed by round-table discussions. Once consensus was achieved the final manuscript was drafted by the lead authors, which was ultimately approved by the Working Group.

RESULTS

The PRISMA flow chart establishing the search strategy and data are presented in Figure 1. The methodological quality assessments of the 39 RCT's included for the final qualitative analysis are summarised in Supplementary Table 1. The characteristics of the included studies are shown in Supplementary Tables 2 and 3.

Systemic Analgesic Interventions

Cakan et al. performed a placebo-controlled trial to evaluate the effect of intravenous (IV) paracetamol 1000 mg during the first 24 postoperative hours. [10] Rescue analgesia included IV patient-controlled analgesia (IV-PCA) morphine. Pain scores were significantly lower at 12 h, 18 h and 24 h post-surgery. However, morphine consumption was not statistically significant between the groups.

Kesimci et al. compared oral dexketoprofen 25 mg to oral paracetamol 500 mg to placebo, 30 minutes before induction of anaesthesia. [11] Rescue analgesia included IV-PCA morphine. There were no significant differences in pain scores between groups; however opioid consumption was significantly lower in the dexketoprofen group.

Khajavikhan et al. compared celecoxib 400 mg administered 2 h before surgery and 200 mg administered 6 h after surgery with placebo. [12] Rescue analgesia included intermittent IV morphine. Significantly lower pain scores were noted in the celecoxib group and total opioid consumption was also significantly lower in the celecoxib group.

Attia et al. compared oral etoricoxib 120 mg, oral duloxetine 60 mg, the combination of oral etoricoxib 120 mg and duloxetine 60 mg and placebo. [13] The drugs were administered

1 h before surgery as well as 24 h after surgery. Rescue analgesia included IV paracetamol and intermittent IV morphine. Pain scores were significantly lower at all times in patients receiving the combination of etoricoxib and duloxetine as well in patients receiving etoricoxib alone. Patients receiving the combination of etoricoxib and duloxetine also had significantly lower opioid consumption after surgery.

Duttchen et al. compared IV ketorolac 30 mg to IV ketorolac 15 mg. [14] Rescue analgesia included intermittent IV morphine. There was no significant difference between the two groups.

Nikooseresh et al. compared diclofenac 100 mg suppository to IV paracetamol 1000 mg. [15] Rescue analgesia included IV-PCA fentanyl. There was no significant difference in pain scores, however opioid consumption was significantly lower with diclofenac.

Cassinelli et al. compared ketorolac 30 mg (15 mg if patient age > 65 years) to placebo. [16] Rescue analgesia included oral oxycodone and intermittent IV morphine. Pain scores and opioid consumption were significantly lower at 0 h and 4 h after surgery in patients receiving ketorolac.

Emamhadi et al. compared diclofenac 100 mg suppository to IM pethidine 0.5 mg/kg. [17] Rescue analgesia was not reported. Significantly lower pain scores were reported with pethidine at all time points after surgery.

Yadav et al. compared pregabalin 150 mg to pregabalin 300 mg and to placebo, administered 2 h before surgery. [18] Rescue analgesia included oral NSAIDs and IV-PCA fentanyl. Pain scores and opioid consumption after surgery were significantly lower in both groups of patients receiving pregabalin, without significant differences between the two different doses of pregabalin. There was a higher incidence of dizziness and blurred vision in patients receiving pregabalin 300 mg.

Kumar et al. compared oral pregabalin 150 mg, administered 1 h before induction, with oral tramadol 100 mg and with placebo. [19] Rescue analgesia included intermittent IV fentanyl and IV diclofenac. Significantly lower pain scores and opioid consumption were seen with both pregabalin and tramadol. Post-hoc analysis significantly favored the tramadol group. No significant difference in anxiety was reported. Adverse effects were not reported.

Choi et al. compared oral pregabalin 150 mg – administered twice a day with a total of 8 doses – to the combination of oral pregabalin 150 mg and IV dexamethasone 5 mg and to placebo. [20] Rescue analgesia included continuous IV fentanyl. Pain scores were significantly lower in both intervention groups. Opioid consumption was significantly lower with the combination of pregabalin and dexamethasone. No significant differences in adverse effects were noted.

Javaherforooshzadeh et al. compared oral gabapentin 600 mg, administered 100 min before surgery, to oral melatonin 6 mg and to placebo. [21] Rescue analgesia included IV morphine and IV pethidine. Pain scores were significantly lower in patients that received gabapentin. Opioid consumption was significantly lower in both gabapentin and melatonin groups. No significant differences in adverse effects were noted.

Khan et al. compared oral gabapentin 600 mg, oral gabapentin 900 mg, oral gabapentin 1200 mg and placebo. [22] Rescue analgesia included IV-PCA morphine. Pain scores and opioid consumption were significantly lower in the gabapentin 900 mg and 1200 mg groups. The time of administration (2 h before surgery or at the end of surgery) did not impact the analgesic effect. Adverse effects were not reported.

Vasigh et al. compared oral gabapentin to oral celecoxib in two RCTs. [23, 24] Rescue analgesia included intermittent IV morphine. One RCT compared oral gabapentin 600 mg administered 2 h before surgery and 300 mg 6 h after surgery, the combination of oral gabapentin 300 mg and oral celecoxib 200 mg administered 2 h before surgery and 6 h after surgery, and placebo. [23] Pain scores and opioid consumption were significantly lower in patients receiving the combination of gabapentin and celecoxib. The other RCT compared oral gabapentin 600 mg administered 2 h before surgery and 300 mg 6 h after surgery with oral celecoxib 400 mg administered 2 h before surgery and 200 mg 6 h after surgery and with placebo. [24] Pain scores were lower in patients receiving gabapentin, and opioid consumption was significantly lower in both intervention groups. Adverse effects were not reported.

Ozgenicil et al. compared oral pregabalin 150 mg, oral gabapentin 1200 mg and placebo, administered twice before surgery and twice after surgery. [25] Rescue analgesia included IV-PCA morphine. Pain scores were significantly lower with pregabalin and gabapentin at 1h, 2h, 4h and 6h after surgery. Opioid consumption was significantly lower in both gabapentin and pregabalin groups at all time points, except at 6 h after surgery where opioid consumption was lower with pregabalin. Except for pruritus, the adverse effects observed were similar among groups. The incidence of pruritus was lower in both the gabapentin and pregabalin groups compared to the placebo group.

Wittayapairoj et al. compared IV dexamethasone 0.2 mg/kg administered before surgery to placebo. [26] Rescue analgesia included IV-PCA morphine. Pain scores were not significantly different between the two groups, but opioid consumption was significantly lower in patients receiving dexamethasone.

Ghaffaripour et al. compared IV magnesium, with a loading dose of 30 mg/kg at the start of surgery and a continuous infusion of 10 mg/kg/h during surgery, to placebo. [27] Rescue analgesia included IV-PCA morphine. There were no significant differences between the two groups.

Esmat et al. compared a transdermal fentanyl patch (50 µg/u), a transdermal melatonin delivery system (7 mg) and a transdermal placebo patch. [28] Rescue analgesia included IM pethidine. Pain scores did not differ significantly between groups, but opioid consumption was lower with transdermal fentanyl and melatonin.

Locoregional Anaesthesia

Chan et al. evaluated the analgesic effects of intrathecal fentanyl 15 µg. [29] Patients in the control group did not receive any intervention. Rescue analgesia included IV-PCA morphine. Pain scores and opioid consumption were significantly lower in patients receiving intrathecal fentanyl. No significant differences in adverse effects were noted.

Yen et al. compared intrathecal morphine 3.5 µg/kg (with a maximum dose of 350 µg) to placebo. [30] Rescue analgesia included IV-PCA morphine. There was no significant difference in pain scores. Total opioid consumption however was significantly lower in patients receiving intrathecal morphine. No episodes of respiratory depression were observed in both groups.

Firouzian et al. compared the intrathecal morphine 200 µg to the combination of intrathecal morphine 200 µg and naloxone 20 µg. [31] Rescue analgesia included IV-PCA morphine. Pain scores and opioid consumption were significantly lower in patients receiving the combination of intrathecal morphine and naloxone. No significant differences in adverse effects were noted.

Kundra et al. compared epidural gelfoam soaked in morphine 5 mg to the combination of epidural gelfoam soaked in saline and epidural instillation with morphine 5 mg. [32] Rescue analgesia included IV diclofenac and intermittent IV morphine. Pain scores and opioid consumption were significantly lower in patients receiving epidural gelfoam soaked in morphine 5 mg. No significant differences in adverse effects were noted.

Guilfoyle et al. evaluated the analgesic effects of fentanyl 100 µg administered through an epidural catheter. [33] Patients in the control group received no intervention. Rescue analgesia was not reported. Pain scores were significantly lower in patients that received epidural fentanyl when admitted to the recovery, but not afterwards. No significant differences in adverse effects were noted.

Hassanein et al. compared epidural gelfoam soaked in morphine 5 mg (diluted in crystalloid), epidural gelfoam soaked in morphine 5 mg (diluted in colloid) and epidural instillation with morphine 5 mg. [34] Rescue analgesia included IV diclofenac and intermittent IV morphine. Pain scores and opioid consumption were significantly lower in both epidural gelfoam groups. No significant differences in adverse effects were noted.

Kumari et al. compared epidural gelfoam soaked in 10 ml levobupivacaine 0.25% combined with dexamethasone 10mg, epidural gelfoam soaked in 10 ml levobupivacaine 0.25% combined with saline and epidural gelfoam soaked in saline only. [35] Rescue analgesia included IV tramadol. Pain scores and opioid consumption were significantly lower in both groups that received epidural gelfoam soaked in levobupivacaine. The addition of dexamethasone did not result in significant differences. No significant differences in adverse effects were noted.

Giri et al. compared epidural gelfoam soaked in ketamine 50 mg diluted with 5 mL saline, epidural gelfoam soaked in nalbuphine 10 mg diluted with 5 mL saline and epidural gelfoam soaked in 5 mL saline. [36] Rescue analgesia included IV diclofenac. Pain scores were significantly lower in both intervention groups. Total diclofenac consumption was significantly lower in patients receiving epidural gelfoam soaked in ketamine 50 mg. No significant differences in adverse effects were noted.

Ozbek et al. evaluated the analgesic effects of a paravertebral block, performed with 5 mL levobupivacaine 0,5% for each nerve to upper dermatome of laminectomy level. [37] Patients in the control group did not receive any intervention. Rescue analgesia included IV-PCA morphine. Pain scores and opioid consumption were significantly lower in patients receiving a paravertebral block.

Mordeniz et al. evaluated the analgesic effects of a perineural infiltration with 2 ml of bupivacaine 0.5%. [38] Perineural infiltration was defined as the infiltration of local anaesthetics in the irritated neural root sheath, before root extraction. Patients in the control group did not receive any intervention. Rescue analgesia included IV tramadol Opioid consumption after surgery was significantly lower in patients that received a perineural infiltration.

Torun et al. evaluated the analgesic effects of a perineural infiltration with 0.5 ml of lidocaine 2%. [39] Patients in the control group did not receive any intervention. Rescue analgesia included IV tramadol. Opioid consumption after surgery was significantly lower in patients that received a perineural infiltration.

Saini et al. compared wound instillation with 20 ml of ropivacaine 0.25% to placebo. [40] Wound instillation was defined as the irrigation of the local analgesic into the surgical area for a dwell time of 60 seconds. Rescue analgesia included IV paracetamol and IV diclofenac. Pain scores and opioid consumption after surgery were significantly lower in the intervention group.

Jonnavithula et al. compared wound instillation with 20 ml of bupivacaine 0.25% to placebo. [41] Rescue analgesia included IM diclofenac. Pain scores and opioid consumption were significantly lower in patients that received wound instillation with bupivacaine.

Rahmanian et al. compared surgical wound instillation with 30 ml of bupivacaine 0.25% with placebo. [42] Rescue analgesia was not reported. Pain scores after surgery did not differ between the two groups.

Gurbet et al. compared wound infiltration with 20 ml of levobupivacaine 0.25% combined with methylprednisolone 40 mg, wound infiltration with 20 ml of bupivacaine 0.25% combined with methylprednisolone 40 mg and placebo. [43] Wound infiltration was defined as direct administration of the local analgesic along the line of the incision. Rescue analgesia included IV-PCA morphine. Pain scores and opioid consumption were significantly lower in both intervention groups.

Hazarika et al. compared local wound infiltration with 20 ml of bupivacaine 0.25% combined with magnesium sulfate 500 mg to 20 ml of ropivacaine 0.25% combined with magnesium sulfate 500 mg. [44] Rescue analgesia included IV nalbuphine. There was no significant difference in pain scores after surgery, however opioid consumption was significantly lower in patients that received local wound infiltration with bupivacaine.

Multimodal Analgesia

Garcia et al. evaluated the analgesic effects of a multimodal analgesic regimen (celecoxib 100 mg twice a day, pregabalin 75 mg twice a day and oxycodone 10 mg twice a day). [45] Patients in the control group did not receive any intervention. Rescue analgesia included intermittent IV morphine. Pain scores and opioid consumption were significantly lower at all time points in patients receiving the multimodal regimen.

Anaesthetic Technique

Vasigh et al. compared induction of anaesthesia with thiopentone and maintenance with sevoflurane, induction and maintenance with propofol, and induction with propofol and maintenance with sevoflurane. [46] Rescue analgesia included intermittent IV morphine. Pain scores and opioid consumption were significantly lower with an induction of anaesthesia with propofol and maintenance with sevoflurane.

Duger et al. compared spinal anaesthesia with 2 ml of bupivacaine 0.5% combined with morphine 0.1 mg, epidural anaesthesia with 10 ml of bupivacaine 0.5% combined with morphine 2 mg and combined spinal and epidural anaesthesia [CSE] with 1 ml of intrathecal bupivacaine 0.5% combined with morphine 0.05 mg and 6 ml of epidural bupivacaine 0.5%

combined with morphine 2 mg. [47] Rescue analgesia included IV-PCA morphine. Pain scores and opioid consumption were significantly lower with epidural anaesthesia and CSE.

Surgical Technique

Watanabe et al. compared the technique of lumbar spinous process splitting laminectomy (LPSL) to the conventional technique of laminectomy. [48] Rescue analgesia included oral NSAIDs. Pain scores were significantly lower with LPSL. There was no significant difference between groups in opioid consumption.

DISCUSSION

Interpretation

This systematic review included 39 RCTs with the majority of studies determined to be of high quality by the CONSORT statement. The strength of our systematic review stems from the PROSPECT methodology which goes beyond making recommendation based on the simple statistical analysis of the available evidence. The included studies are interpreted based on the use of a baseline analgesic technique (i.e., use of paracetamol and NSAID or COX-2 selective inhibitor) and balancing the efficacy and adverse effects of the intervention as well as assimilating this information in the perioperative setting of lumbar laminectomy. Overall, the PROSPECT recommendations provide clinicians with supporting arguments for and against the use of analgesic interventions for laminectomy.

Based on the PROSPECT methodology, a combination of paracetamol and NSAID or COX-2 selective inhibitor is recommended preoperatively or intraoperatively, which should be continued into the postoperative period, unless there are contraindications. Excellent evidence is available for the use of NSAIDs / COX-2 selective inhibitors, with five out of seven RCTs demonstrating improved outcomes. [11, 12, 13, 15, 16]. Duttchen et al. could not demonstrate a significant difference in outcomes between two different doses of ketorolac. [14] Emamhadi et al. compared the use of diclofenac to pethidine, showing less pain in patients treated with pethidine. [17] On the other hand, there is only one RCT available where the effect of paracetamol in patients undergoing lumbar laminectomy was evaluated. [10] However, the opioid-sparing effects of paracetamol are well described, and for this reason paracetamol is also recommended for lumbar laminectomy. Furthermore, both Kesimci et al. and Nikosereth et al. reported no significant difference in postoperative pain scores between NSAIDs and paracetamol. [11, 15]

Wound instillation or infiltration with local anaesthetics, performed by the surgeon just before wound closure, is recommended as the regional anaesthetic technique of choice. Wound instillation is defined as the irrigation of the local anaesthetics into the surgical area, while wound infiltration is defined as the direct injection of local anaesthetics into the tissue along the line of incision. For this recommendation, we decided not to distinguish between wound instillation and wound infiltration because these two techniques are closely related. Three RCTs of high quality showed significantly improved outcomes using wound instillation or infiltration. [40, 41, 43] One RCT did not show a significant analgesic benefit after wound instillation. [42] Another RCT compared the infiltration of two different local anaesthetics without a placebo group [44]. It is possible that some of the benefits from local anaesthetic wound instillation may be due to migration of local anaesthetic into the neuraxial planes. Surgical wound instillation or infiltration remains a simple technique that can be rapidly performed, with limited risk for side effects including anaesthetic systemic toxicity. Although the studies did not describe infiltration techniques, it is well accepted that any surgical site infiltration should involve local anaesthetic injection into multiple layers, similar to local infiltration techniques used for joint surgery. Intrathecal opioids have been demonstrated to provide excellent pain relief in patients undergoing lumbar laminectomy. [29 – 31] However, the potential side effects are worrisome, particularly because this procedure is increasingly being performed as an outpatient procedure [2, 3]. These potential side effects include – but are not limited to – respiratory depression, cardiovascular stress, cognitive dysfunction, delayed wound healing, urinary and gastrointestinal dysfunction; as well as the risk of acquired tolerance and long-term opioid use. Therefore, it is prudent to avoid intrathecal opioids. In addition, it is unclear if these neuraxial techniques provide any further enhanced clinically relevant pain relief over the use of basic analgesics combined with local anaesthetic instillation or infiltration. For the same reason, epidural analgesia is not recommended. [32 – 36] Other regional anaesthetic techniques, such as paravertebral blocks and perineural infiltration, are not recommended due to limited procedure-specific evidence. [37 – 39]

Gabapentinoids are not recommended as the first line of treatment in spite of proven efficacy in this patient population. [18 – 25] Similar to intrathecal and epidural analgesia, a significant risk of important side effects (including, but not limited to sedation, dizziness, visual blurring) is associated with the administration of these drugs. The FDA recently published an advisory emphasising the concerns of gabapentin and pregabalin [49].

Only limited procedure-specific evidence was available for dexamethasone, with one RCT showing reduced opioid consumption [26]. Therefore, dexamethasone cannot be recommended as part of the standard analgesic regimen in patients undergoing lumbar laminectomy. Nonetheless, it has an important role in the prevention of postoperative nausea and vomiting [50]. There were no published data assessing the analgesic effects of ketamine

and alpha-2-agonists, such as dexmedetomidine or clonidine, which could be assessed in future studies.

We have found no evidence regarding analgesic regimens for challenging patient populations, such as chronic opioid consumers, which is a common phenomenon in this surgical population. Hence there is a need for further research on this topic.

Opioids are recommended only as rescue medication for patients undergoing lumbar laminectomy. [51] We caution against the use of transdermal fentanyl patches in the perioperative period, because this treatment is not adapted for the treatment of acute postoperative pain. [52]

Limitations

The limitations in this review are related to those of the included studies. There was considerable heterogeneity between studies such as variable dosing regimens, variable methods of administration and variable control groups as well as variable time points of pain assessments. The small size of most studies has the potential for estimation effect. In addition, the sample size of the studies was not adequate to draw valid conclusions concerning the safety profile of the analgesic interventions. Also, the analgesic interventions were not evaluated against a control group that included an optimized multimodal analgesic regimen.

Implications for future research

Future adequately powered studies should assess the effects of analgesic interventions not only on pain, opioid consumption, opioid-related adverse events and complications associated with the intervention, but also outcome measures such as time to ambulation, length of hospital stay, and the occurrence of chronic pain or chronic opioid consumption. Furthermore, the influence of analgesic intervention on patient-specific factors such as chronic pain and chronic opioid therapy need to be assessed.

CONCLUSION

In summary, this review has identified a perioperative analgesic regimen for optimal pain management after lumbar laminectomy (Table 1). This review also identified perioperative interventions that are not recommended for pain management in patients undergoing lumbar laminectomy (Table 2). Perioperative pain management for lumbar laminectomy should include paracetamol and NSAID or COX-2 selective inhibitor, continued into the postoperative period, as well as intraoperative surgical wound instillation or infiltration. Opioids should be used as rescue medication postoperatively.

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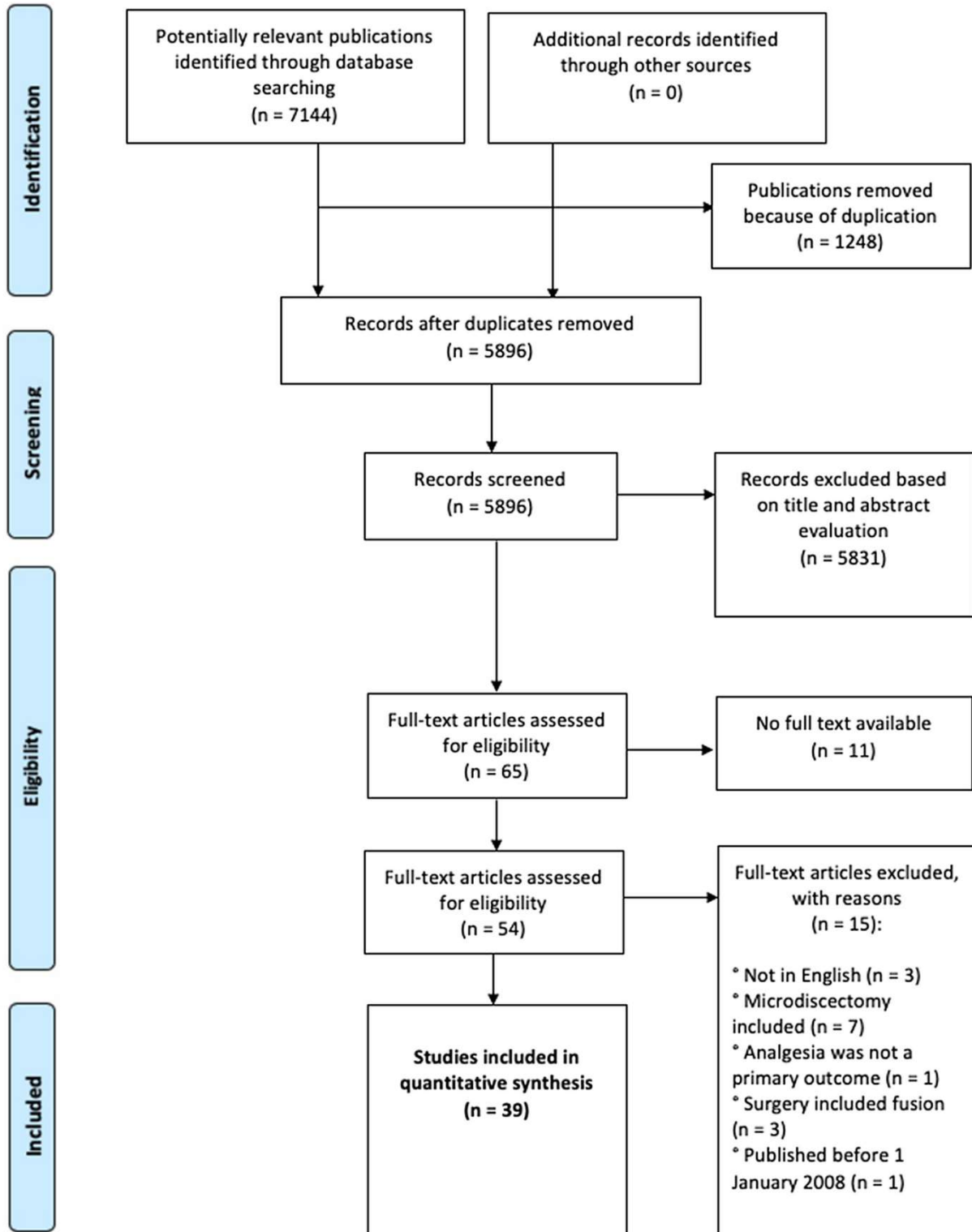
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FIGURES

Figure 1. PRISMA Flowchart



TABLES

Table 1. Overall recommendations for perioperative pain management in patients undergoing lumbar laminectomy

Preoperative and intraoperative recommendations
<ul style="list-style-type: none"> • Oral or IV paracetamol (Grade D)
<ul style="list-style-type: none"> • Oral or IV NSAIDs / COX-2 selective inhibitors (Grade A)
<ul style="list-style-type: none"> • Surgical wound instillation or infiltration with local anaesthetic (Grade A)
Postoperative recommendations
<ul style="list-style-type: none"> • Oral or IV paracetamol (Grade D)
<ul style="list-style-type: none"> • Oral or IV NSAIDs / COX-2 selective inhibitors (Grade A)
<ul style="list-style-type: none"> • Opioids as rescue medication (Grade D)

Abbreviations: COX-2 (cyclooxygenase-2); IV (intravenous); NSAIDs (non-steroidal anti-inflammatory drugs)

Table 2. Analgesic interventions that are not recommended for pain management in patients undergoing lumbar laminectomy

Intervention	Reason for not recommending
Dexamethasone	Limited procedure-specific evidence
Oral gabapentin / pregabalin	Significant risk for adverse effects
Intrathecal opioids	Significant risk for adverse effects
Epidural analgesia	Limited procedure-specific evidence and risk for adverse effects
Paravertebral block	Limited procedure-specific evidence
Corticosteroids	Limited procedure-specific evidence
Intravenous Magnesium	Lack of procedure-specific evidence
Transdermal fentanyl	Limited procedure-specific evidence and risk for adverse effects

Supplementary Table 1. Quality assesment assigned to the randomized controlled trials that were included in the review for perioperative pain management in patients undergoing lumbar laminectomy (n = 39)

Study	Allocation concealment	Jadad score	Statistical analysis + patient follow-up	Met CONSORT?
Cakan et al. [10]	Yes	4	No	No
Kesimci et al [11]	Yes	5	Yes	Yes
Khajavikhan et al. [12]	Yes	5	Yes	Yes
Attia et al. [13]	Yes	5	Yes	Yes
Duttchen et al. [14]	Yes	5	Yes	Yes
Nikooseresh et al. [15]	No	3	Yes	No
Cassinelli et al. [16]	Yes	5	Yes	Yes
Emamhadi et al. [17]	No	1	No	No
Yadav et al. [18]	Yes	5	Yes	Yes
Kumar et al. [19]	Yes	5	Yes	Yes
Choi et al. [20]	Yes	5	Yes	Yes
Javaherforooshzadeh et al. [21]	Yes	5	Yes	Yes
Khan et al. [22]	Yes	5	Yes	Yes
Vasigh et al. [23]	Yes	5	Yes	Yes
Vasigh et al. [24]	Yes	5	Yes	Yes
Ozgenicil et al. [25]	Yes	5	Yes	Yes
Wittayaparoij et al. [26]	Yes	5	Yes	Yes
Ghaffaripour et al. [27]	Yes	5	Yes	No
Esmat et al. [28]	Yes	5	Yes	Yes
Chan et al. [29]	No	3	Yes	No
Yen et al. [30]	Yes	5	Yes	Yes
Firouzian et al. [31]	Yes	5	Yes	Yes
Kundra et al. [32]	Yes	4	Yes	No
Guilfoyle et al. [33]	Yes	3	Yes	No
Hassanein et al. [34]	Yes	5	Yes	Yes
Kumari et al. [35]	Yes	5	Yes	Yes
Giri et al. [36]	Yes	5	Yes	No

Ozbek et al. [37]	Yes	3	Yes	No
Mordeniz et al. [38]	Yes	1	No	No
Torun et al. [39]	Yes	3	Yes	No
Saini et al. [40]	Yes	5	Yes	No
Jonnavithula et al. [41]	Yes	5	Yes	Yes
Rahmanian et al. [42]	Yes	3	No	No
Gurbet et al. [43]	Yes	4	Yes	No
Hazarika et al. [44]	Yes	5	Yes	Yes
Garcia et al. [45]	No	3	Yes	No
Vasigh et al. [46]	Yes	5	Yes	Yes
Duger et al. [47]	No	3	Yes	No
Watanabe et al. [48]	Yes	3	Yes	No

Supplementary Table 2. Summary of key results from studies evaluating systemic analgesics, systemic analgesic adjuncts and regional analgesia used to support the recommended interventions in patients undergoing lumbar laminectomy.

Study	Study design	Pain scores	Total opioid consumption	Basic analgesia and baseline analgesia
<i>Paracetamol</i>				
Cakan et al. 2008 [10]	Paracetamol 1000 mg (n=20) vs placebo (n=20)	Favours paracetamol group at 12h, 18h and 24h	Patient controlled IV morphine post op : NS	No basic analgesia and no additional baseline analgesia
<i>NSAIDs / COX-2 selective inhibitors</i>				
Kesimci et al. 2011 [11]	Dexketoprofen 25 mg (n=25) vs paracetamol 500 mg (n=25) vs placebo (n=25)	NS	Patient controlled IV morphine post op: Favours dexketoprofen group at 2h, 6h and 24h	No basic analgesia and no additional baseline analgesia
Khajavikhan et al. 2016 [12]	Celecoxib [400 mg preoperatively; 200 mg postop] (n=38) vs placebo (n=38)	Favours celecoxib group at 2h, 4h, 6h, 8h, 12h, 24h	Morphine IV post op: Favours celecoxib group at 24h	No basic analgesia and no additional baseline analgesia
Attia et al. 2017 [13]	Etoricoxib 120 mg (n=30) vs duloxetine 60 mg (n=30) vs combination of etoricoxib 120 mg + duloxetine 60 mg vs placebo	Favours the combination of etoricoxib and duloxetine, as well as etoricoxib at all times	Morphine IV (2mg bolus) post op: Favours the combination of etoricoxib and duloxetine	Basic analgesia: Paracetamol 1g intraoperative. No additional baseline analgesia

Duttchen et al. 2017 [14]	Ketorolac 15 mg (n=25) vs ketorolac 30 mg (n=25)	NS	Morphine IV post op: NS	No basic analgesia and no additional baseline analgesia
Nikooseresht et al. 2016 [15]	Diclofenac 100 mg suppo (n=51) vs acetaminophen 1000 mg IV (n=51)	NS	Patient controlled IV fentanyl: Favours diclofenac group	No basic analgesia and no additional baseline analgesia
Cassinelli et al. 2008 [16]	Ketorolac 30 mg IV [15 mg if age > 65 years] (n=13) vs placebo (n=12)	Favours ketorolac group at 0h and 4h	IV morphine during the first 24h: Favours ketorolac group	No basic analgesia. Additional baseline analgesia: PO oxycodone after 24h (dose not mentioned)
Emamhadi et al. 2008 [17]	Diclofenac 100 mg suppo (n=50) vs pethidine 0.5 mg/kg IM (n=50)	Favours pethidine group	N/A	No basic analgesia and no additional baseline analgesia
<i>Surgical wound instillation and infiltration</i>				
Saini et al. 2018 [40]	Instillation with 20 ml ropivacaine 0.25% (n=20) vs placebo (n=20)	Favours ropivacaine group	N/A (However, favours ropivacaine group for total diclofenac consumption)	Basic analgesics: Paracetamol 15 mg/kg; diclofenac 75 mg (if NRS > 4/10). No additional baseline analgesia.

Jonnavithula et al. 2017 [41]	Instillation with 20 ml bupivacaine 0.25% (n=16) vs placebo (n=16)	Favours bupivacaine group	N/A (However, favours bupivacaine group for total diclofenac consumption)	Basic analgesia: diclofenac 75 mg IM (if VAS > 3/10). No additional baseline analgesia
Rahmanian et al. 2014 [42]	Instillation with 30 ml bupivacaine 0.25% (n=30) vs placebo (n=30)	NS	IV morphine : Not mentioned	No basic analgesia and no additional baseline analgesia
Gurbet et al. 2014 [43]	Infiltration with 20 ml levobupivacaine 0.25% [+ methylprednisolone 40 mg] (n=19) vs 20 ml bupivacaine 0.25% [+ methylprednisolone 40 mg] (n=18) vs placebo (n=19)	Favours levobupivacaine and bupivacaine groups at 4 h post op	Patient controlled IV morphine post op : Favours levobupivacaine and bupivacaine groups	No basic analgesia and no additional baseline analgesia
Hazarika et al. 2017 [44]	Infiltration with 20 ml Bupivacaine 0.25% [+ magnesium sulfate 500 mg] (n=30) vs 20 ml Ropivacaine 0.25% [+ magnesium sulfate 500 mg] (n=31)	NS	Continuous IV fentanyl infusion; Nalbuphine IV for breakthrough pain: Favours bupivacaine group	No basic analgesia and no additional baseline analgesia

Abbreviations: COX-2 (cyclooxygenase-2); h (hours); IM (intramuscular); IV (intravenous); ml (milliliter); N/A (not applicable); NRS (numeric rating score); NS (not significant); NSAIDs

(non-steroidal anti-inflammatory drugs); PO (per os); post op (postoperatively); suppo (suppository); VAS (visual analogue scale)

Supplementary Table 3. Summary of key results from studies evaluating systemic analgesics, systemic analgesic adjuncts and regional analgesia that are not recommended interventions in patients undergoing lumbar laminectomy

Study	Study design	Pain scores	Total opioid consumption	Basic analgesia and baseline analgesia
Gabapentinoids				
Yadav et al. 2018 [18]	Pregabalin 300 mg (n=20) vs Pregabalin 150 mg (n=20) vs placebo (n=20)	Favours Pregabalin groups; no significant difference between doses	Patient controlled fentanyl IV: Favours Pregabalin groups; no significant difference between doses	Basic analgesia: PO NSAID. No additional baseline analgesia
Kumar et al. 2013 [19]	Pregabalin 150 mg (n=25) vs Tramadol 100mg (n=25) vs placebo (n=25)	Favours Pregabalin and Tramadol groups; post-hoc analysis favours Tramadol group above Pregabalin group	Fentanyl IV post op : Favours Pregabalin and Tramadol groups	Basic analgesia: diclofenac IV. No additional baseline analgesia
Choi et al. 2013 [20]	Pregabalin 150 mg [+ dexamethasone 5 mg] (n=36) vs Pregabalin 150 mg [+ placebo] (n=36) vs	Favors Pregabalin groups at rest; NS during movement	Continuous IV fentanyl infusion: Favours Pregabalin + dexamethason	Basic analgesia: ketorolac IV. No additional baseline analgesia

	placebo [+ placebo] (n=36)		e group at all time points	
Javaherforooshzadeh et al. 2018 [21]	Gabapentin 600 mg (n=30) vs Melatonin 6 mg (n=30) vs placebo (n=30)	Favours Gabapentin group at all time points	Morphine IV and pethidine IV for breakthrough pain: Favours both Gabapentin and Melatonin groups	No basic analgesia and no additional baseline analgesia
Khan et al. 2011 [22]	Gabapentin 1200 mg preop (n=25) vs Gabapentin 1200 mg post op (n=25) vs Gabapentin 900 mg preop (n=25) vs Gabapentin 900 mg postop (n=25) vs Gabapentin 600 mg preop (n=25) vs Gabapentin 600 mg post op (n=25) vs placebo (n=25)	Favours Gabapentin 1200 mg groups and Gabapentin 900 mg groups	Patient controlled IV morphine post op: Favours Gabapentin 1200 mg groups and Gabapentin 900 mg groups	No basic analgesia and no additional baseline analgesia
Vasigh et al. 2016 [23]	Gabapentin [600 mg preop; 300 mg post op] (n=38) vs Gabapentin 300 mg + celecoxib 200 mg [preop + postop] (n=38)	Favours Gabapentin + celecoxib group	Morphine IV post op: Favours Gabapentin + celecoxib group	No basic analgesia and no additional baseline analgesia

	vs placebo (n=38)			
Vasigh et al. 2016 [24]	Gabapentin [600 mg pre op; 300mg post op] (n=38) vs Celecoxib [400 mg preop; 200 mg post op] (n=38) vs placebo (n=38)	Favours Gabapentin group	Morphine IV post op: Favours Gabapentin and Celecoxib groups	No basic analgesia and no additional baseline analgesia
Ozgencil et al. 2011 [25]	Gabapentin 1200 mg (n=30) vs Pregabalin 150 mg (n=30) vs placebo (n=30)	Favours Gabapentin and Pregabalin groups at 1h, 2h, 4h and 6h post op	Patient controlled IV morphine post op: Favours Pregabalin group at 6h post op; Favours Gabapentin and Pregabalin groups at all other timepoints	No basic analgesia and no additional baseline analgesia
Corticosteroids				
Wittayapairoj et al. 2017 [26]	Dexamethasone 0.2 mg/kg IV (n=40) vs placebo (n=40)	NS	Patient controlled IV morphine post op: Favours dexamethasone group	No basic analgesia and no additional baseline analgesia
Magnesium				
Ghaffaripour et al. 2016 [27]	Magnesium sulfate 30 mg/kg	NS	Patient controlled IV	No basic analgesia

	IV [+ 10 mg/kg/h continuous infusion intraoperative] (n=20) vs placebo (n=20)		morphine post op : NS	and no additional baseline analgesia
<i>Transdermal fentanyl</i>				
Esmat et al. 2017 [28]	Transdermal fentanyl 50 µg/u (n=25) vs Transdermal melatonin 7 mg (n=25) vs placebo	NS	Pethidine 0.5 mg/kg IM: Favours Transdermal fentanyl as well as melatonin groups	No basic analgesia and no additional baseline analgesia
<i>Intrathecal analgesia</i>				
Chan et al. 2008 [29]	Fentanyl 15 µg intrathecal (n=30) vs placebo (n=30)	Favours Fentanyl group at 2h, 4h and 24 h post op	Patient controlled IV morphine post op: Favours Fentanyl group	No basic analgesia and no additional baseline analgesia
Yen et al. 2015 [30]	Morphine 3.5 µg/kg [maximum of 350 µg] intrathecal (n=16) vs placebo (n=16)	NS	Patient controlled IV morphine post op: Favours Intrathecal morphine groups	No basic analgesia and no additional baseline analgesia
Firouzian et al. 2018 [31]	Morphine 200 µg [+ naloxone 20 µg] intrathecal (n=40) vs Morphine 200	Favours Intrathecal morphine + naloxone group	Patient controlled IV morphine post op: Favours Intrathecal morphine +	No basic analgesia and no additional baseline analgesia

	µg intrathecal (n=37)		naloxone group	
<i>Epidural analgesia</i>				
Kundra et al. 2014 [32]	Epidural gelfoam soaked in morphine 5 mg (n=75) vs Epidural gelfoam soaked in saline [+ epidural instillation with morphine 5 mg] (n=75)	Favours Epidural gelfoam soaked in morphine group	Morphine IV post op: Favours Epidural gelfoam soaked in morphine group	Basic analgesia: diclofenac 75 mg. No additional baseline analgesia.
Guilfoyle et al. 2008 [33]	Fentanyl 100 µg via epidural catheter (n=29) vs no intervention (n=31)	Favours Epidural fentanyl group in the recovery; NS at day 1 and day 2	N/A	No basic analgesia and no additional baseline analgesia
Hassanein et al.2016 [34]	Epidural gelfoam soaked in morphine 5 mg [diluted in crystalloid] (n=25) vs Epidural gelfoam soaked in morphine 5 mg [diluted in colloid] (n=25) vs Epidural instillation with morphine 5 mg	Favours both Epidural gelfoam groups at 10h, 14h, 18h, 22h and 30h post op	Morphine IV post op: Favours both Epidural gelfoam groups	Basic analgesia: diclofenac 75 mg. No additional baseline analgesia.
Kumari et al. 2018 [35]	Epidural gelfoam soaked	Favours both Epidural	Tramadol IV: Favours both	No basic analgesia

	in 10 ml levobupivacaine 0.25% [+ dexamethasone 10 mg] (n=25) vs Epidural gelfoam soaked in 10 ml levobupivacaine 0.25% [+ placebo] (n=25) vs Epidural gelfoam soaked in saline [+ placebo]	gelfoam soaked in levobupivacaine groups	Epidural gelfoam soaked in levobupivacaine groups	and no additional baseline analgesia
Giri et al. 2018 [36]	Epidural gelfoam soaked in ketamine 50 mg [diluted in saline] (n=20) vs. Epidural gelfoam soaked in nalbuphine 10 mg [diluted in saline] (n=20) vs. Epidural gelfoam soaked in saline	Favours both Epidural gelfoam soaked in ketamine and Epidural gelfoam soaked in nalbuphine groups at all time points; Favours Epidural gelfoam soaked in ketamine group at 10h, 14h, 18h, 22h and 30h above Epidural gelfoam soaked in nalbuphine.	N/A (However, favours Epidural gelfoam soaked in ketamine group for total diclofenac consumption)	Basic analgesia: diclofenac 75mg IV. No additional baseline analgesia
Regional analgesia				
<i>Paravertebral block</i>				

Ozbek et al. 2009 [37]	Levobupivacaine 0.5% 5ml [for each nerve to upper dermatome of laminectomy level] vs no intervention	Favours levobupivacaine group	Patient controlled IV morphine post op : Favours levobupivacaine group	No basic analgesia and no additional baseline analgesia
Perineural infiltration				
Mordeniz et al. 2010 [38]	Bupivacaine 0.5% 2 ml (n=22) vs No intervention (n=29)	N/A	Tramadol IV post op : Favours bupivacaine group	No basic analgesia and no additional baseline analgesia
Torun et al. 2010 [39]	Lidocaine 2% 0.5 ml (n=20) vs No intervention (n=25)	N/A	Tramadol IV post op : Favours lidocaine group	No basic analgesia and no additional baseline analgesia
Multimodal analgesia				
Garcia et al. 2013 [45]	Multimodal regimen [Celecoxib 100 mg twice a day; pregabalin 75 mg twice a day; oxycodone 10 mg twice a day] (n=12) vs no intervention (n=10)	Favours Multimodal regimen at all time points	Morphine IV post op : Favours Multimodal regimen	No basic analgesia. Additional baseline analgesia: PO oxycodone after 24h (dose not mentioned)
Choice of hypnotic				

Vasigh et al. 2017 [46]	Group A [induction with thiopentone; maintenance with sevoflurane] (n=25) vs Group B [induction and maintenance with propofol] (n=25) vs Group C [induction with propofol; maintenance with sevoflurane] (n=25)	Favours Group C at all time points	Morphine IV post op : Favours Group C	No basic analgesia and no additional baseline analgesia
Choice of neuraxial analgesia				
Düger et al. 2013 [47]	Spinal anesthesia [bupivacaine 0.5% 2 ml + morphine 0.1 mg] (n=22) vs Epidural anesthesia [bupivacaine 0.5% 10 ml + morphine 2 mg] (n=21) vs CSE [bupivacaine 0.5% 1ml + morphine 0.05 mg intrathecal; bupivacaine 0.5% 6 ml +	Favours epidural anesthesia as well as CSE at 4h, 6h, 12h and 24h	Patient-controlled IV morphine post op: Favours epidural anesthesia as well as CSE	No basic analgesia and no additional baseline analgesia

	morphine 2 mg epidural] (n=21)			
<i>Surgical technique</i>				
Watanabe et al. 2010 [48]	Lumbar spinous process splitting laminectomy (n=22) vs Conventional laminectomy (n=19)	Favours Lumbar spinous process splitting laminectomy	N/A	Basic analgesia: PO loxoprofen. No additional baseline analgesia

Abbreviations: COX-2 (cyclooxygenase-2); CSE (combined spinal and epidural anesthesia)
h (hours); IV (intravenous); IM (intramuscular); ml (milliliter); N/A (not applicable); NRS
(numeric rating score); NS (not significant); NSAIDs (non-steroidal anti-inflammatory drugs);
PO (per os); preop (preoperatively); post op (postoperatively); suppo (suppository); VAS
(visual analogue scale)

LE CACHEUX Pauline. Prise en charge peropératoire de la douleur lors d'une laminectomie: revue de la littérature et recommandations du groupe PROSPECT

56 feuilles, 1 illustration, 5 tableaux. Thèse : Médecine ; Rennes 1; 2021 ; N°40-2021

Résumé français

Objectif: La laminectomie lombaire étant de plus en plus pratiquée en ambulatoire, une gestion adaptée de la douleur est essentielle pour diminuer les délais de séjour des patients et éviter une réadmission précoce en hospitalisation. Notre objectif était d'évaluer la littérature disponible à ce sujet et d'élaborer des recommandations pour une prise en charge optimale de la douleur après une laminectomie lombaire à un ou deux niveaux.

Méthodes: Une revue systématique a été entreprise utilisant la méthodologie PROSPECT (PROcedure SPECific Postoperative Pain Management). Des essais contrôlés randomisés (ECR) publiés en anglais du 1er janvier 2008 au 31 mars 2020 - évaluant l'impact d'interventions analgésiques, anesthésiques ou chirurgicales sur la douleur postopératoire - ont été identifiés à partir des bases de données MEDLINE, EMBASE et Cochrane.

Résultats: Sur 65 études éligibles identifiées, 39 ECR répondaient aux critères d'inclusion. Le schéma analgésique pour la laminectomie lombaire devrait probablement inclure du paracétamol et un anti-inflammatoire non stéroïdien (AINS) ou un inhibiteur sélectif de la cyclooxygénase (COX) -2 administré en préopératoire ou peropératoire et poursuivi en postopératoire. Les opioïdes peuvent être utilisés en dernier recours. De plus, une instillation chirurgicale de la plaie ou une infiltration avec des anesthésiques locaux avant la fermeture de la plaie est recommandée. Certaines interventions - gabapentinoïdes et administration intrathécale d'opioïdes -, bien qu'efficaces, comportent des risques importants et ne font par conséquent pas partie des recommandations. D'autres interventions n'étaient pas non plus recommandées en raison d'une insuffisance, d'une incohérence ou d'un manque de preuves.

Conclusion: La gestion de la douleur périopératoire pour la laminectomie lombaire doit inclure le paracétamol et les AINS ou inhibiteurs sélectifs de la COX-2, poursuivis pendant la période postopératoire, ainsi que l'instillation ou l'infiltration chirurgicale peropératoire de la plaie. Les opioïdes doivent être utilisés comme médicaments de secours après l'opération. Des études futures sont nécessaires pour évaluer l'efficacité de nos recommandations.

Rubrique de classement : ANESTHÉSIE DOULEUR

Mots-clés : Laminectomie, revue, analgésie, médecine basée sur les preuves

Mots-clés anglais MeSH : Laminectomy, analgesia, systematic review, evidence-based medicine

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