Review Article

Pain Management in the Elderly with Herniated Disc: Exploring NSAID Options for Nonsurgical Treatment

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Abstract

As global populations age, the demand for orthopedic surgery continues to rise, with low back pain (LBP)—particularly due to herniated nucleus pulposus (HNP)—among the most common reasons for consultation and surgical intervention. However, surgical decisions in elderly patients are often complex due to clinical risks and comorbidities. This review examines the role of pharmacologic therapy as a first-line conservative treatment for HNP in older adults, focusing on the efficacy and safety of nonsteroidal anti-inflammatory drugs (NSAIDs), analgesics, opioids, antidepressants, anticonvulsants, and corticosteroid injections. NSAIDs such as ibuprofen, diclofenac, and etodolac are effective but pose risks of gastrointestinal, cardiovascular, and renal complications. Alternatives like paracetamol and metamizole offer better gastrointestinal tolerance, while tramadol is a preferred opioid because it carries a lower risk of dependence. Non-pharmacological interventions—including physical therapy, acupuncture, moxibustion, and minimally invasive procedures like ozone chemonucleolysis—are also discussed as valuable adjuncts. While conservative management often results in significant symptom relief, prolonged reliance without timely surgical evaluation may lead to suboptimal outcomes. Therefore, a personalised, evidence-based approach that carefully balances risks and benefits is essential to optimise outcomes and minimise adverse effects in elderly patients with HNP.
Keywords: *herniated nucleus pulposus, low back pain, NSAIDs, nonsurgical, pain management.*

Manajemen Nyeri dengan Hernia Nukleus Pulposus pada Lansia: Eksplorasi Pilihan OAINS untuk Terapi Tanpa Pembedahan

Abstrak

Seiring dengan bertambahnya usia populasi global, kebutuhan akan pembedahan ortopedi terus meningkat, dengan nyeri punggung bawah terutama yang disebabkan oleh hernia nukleus pulposus (HNP)—menjadi salah satu alasan tersering untuk konsultasi dan tindakan bedah. Namun, pengambilan keputusan bedah pada pasien lanjut usia sering kali kompleks karena adanya risiko klinis dan komorbiditas. Tinjauan ini membahas peran terapi farmakologis sebagai tatalaksana konservatif lini pertama pada HNP pada kelompok usia lanjut, dengan fokus pada efektivitas dan keamanan obat antiinflamasi nonsteroid (OAINS), analgesik, opioid, antidepresan, antikonvulsan, serta injeksi kortikosteroid. OAINS seperti ibuprofen, diklofenak, dan etodolak efektif, tetapi berisiko menimbulkan komplikasi gastrointestinal, kardiovaskular, dan ginjal. Alternatif seperti parasetamol dan metamizol memiliki tolerabilitas gastrointestinal yang lebih baik, sementara tramadol merupakan opioid yang lebih disukai karena memiliki risiko ketergantungan yang lebih rendah. Intervensi nonfarmakologis—termasuk fisioterapi, akupunktur, moksibusi, serta prosedur minimal invasif seperti kemonukleolisis ozon—juga dibahas sebagai terapi tambahan yang bernilai. Meskipun penatalaksanaan konservatif sering memberikan perbaikan gejala yang bermakna, ketergantungan yang berkepanjangan tanpa evaluasi bedah yang tepat waktu dapat menyebabkan hasil yang kurang optimal. Oleh karena itu, diperlukan pendekatan yang personal dan berbasis bukti dengan menyeimbangkan secara cermat antara risiko dan manfaat guna mengoptimalkan luaran dan meminimalkan efek samping pada pasien lanjut usia dengan HNP.
Kata kunci: *hernia nukleus pulposus, nyeri punggung bawah, OAINS, non bedah, manajemen nyeri.*

Introduction

In the context of increasing surgical demand among ageing populations, back pain is among the most common reasons patients seek orthopaedic surgical care. Although many musculoskeletal disorders are present in orthopedics, low back pain remains a principal reason for consultation and often necessitates surgery.[1] These data align with prior reports showing that 65–85% of older adults suffer musculoskeletal pain, of whom 36–70% report back pain. Low back pain (LBP) has been identified as the most prevalent health issue among older adults, frequently resulting in both persistent pain and physical disability.[2,3]

About 85% of LBP cases involve lumbar disc herniation, which occurs in roughly 5–20 per 1,000 adults. It most often affects adults aged 20–50 and is roughly twice as common in males as in females.[4] Lumbar and cervical disc herniations are among the most prevalent spinal pathologies in aging populations, frequently leading to nerve compression and functional disability. A comprehensive review further highlighted that herniated nucleus pulposus (HNP), particularly in the lumbar spine, is a common consequence of degenerative changes and remains a significant cause of spinal nerve compression requiring surgery.[5] Despite increasing surgical rates for HNP in older adults, the decision remains complex because of clinical risks and comorbidities.[6]

As age increases, progressive deterioration of trabecular and cortical bone, along with changes in the composition of bone tissue components and their interactions with various cell types, contributes to a decrease in bone's biological and mechanical integrity. This deterioration weakens the skeletal structure, making it more susceptible to injury and deformity. As a result, bone and joint deformities become more likely, mainly due to bone loss and the cumulative wear and tear of cartilage and surrounding connective tissue that accompanies the aging process.[7,8]

In addition to skeletal changes, aging is also associated with cellular degeneration in intervertebral disc tissues. Recent evidence has identified cellular senescence of nucleus pulposus cells (NPCs) as a significant biological factor influencing surgical outcomes in HNP cases. A study revealed that overexpression of the microRNA hsa-miR-4741 promotes oxidative stress and accelerates NPC aging by suppressing Leukocyte Immunoglobulin Like Receptor B2 (LILRB2), a molecule with anti-senescent properties. The combination of high hsa-miR-4741 and low LILRB2 levels strongly predicted recurrence of disc herniation following surgery, with a diagnostic accuracy of 93.7%. This suggests that advanced disc cell aging not only reflects tissue degeneration but may also impair recovery and increase the likelihood of surgical failure.[9]

Conservative treatment, particularly pharmacologic management, continues to be recommended as the first-line approach for elderly patients with HNP, especially when there are no signs of significant neurological impairment. Nonsurgical interventions, including analgesics, anti-inflammatory medications, and physical therapy, remain effective for symptom management and are often sufficient to avoid surgery.[5] A systematic review by Penchev et al[10] supports this approach by demonstrating that conservative strategies frequently provide substantial relief, with surgical options reserved for patients who do not respond to initial therapies. In addition, Xie et al[11] highlight a compelling biological rationale for conservative treatment, reporting that spontaneous resorption of the herniated disc occurred in approximately 76.6% of patients undergoing non-operative care. This process is facilitated by immune-mediated mechanisms involving macrophage infiltration and neovascularization, suggesting a natural healing capacity that can be optimized through conservative management.[11]

This review aims to reexamine pharmacologic therapy, a modality often overlooked within conservative management, yet increasingly relevant amid rising life expectancy and HNP prevalence. Rather than a passive option, it should

be viewed as a strategic, evidence-based approach that may improve outcomes and reduce surgical risk in older adults.

Methods

A comprehensive literature search was conducted to identify relevant studies on pain management using nonsteroidal anti-inflammatory drugs (NSAIDs) in elderly patients with herniated discs undergoing nonsurgical treatment. The search was conducted between 2015 and 2025 across multiple electronic databases, including PubMed, Scopus, ScienceDirect, and Google Scholar. The following Boolean keywords were used: (“pain management” OR “pain control” OR analgesia) AND (“elderly” OR “older adults” OR “aged” OR “geriatric”) AND (“herniated disc” OR “herniated intervertebral disc” OR “disc herniation” OR “lumbar disc herniation”) AND (“NSAIDs” OR “nonsteroidal anti-inflammatory drugs” OR ibuprofen OR diclofenac OR naproxen OR celecoxib) AND ("nonsurgical treatment" OR "conservative therapy" OR "medical management" OR "pharmacological therapy").

NSAIDs as An Effective Nonsurgical Therapy

Nonsteroidal anti-inflammatory drugs are considered the first-line pharmacologic treatment for older adults with HNP who have no significant neurological deficits. They reduce inflammation and relieve nerve-root pain. World Federation of Neurosurgical Societies recommends NSAIDs because of their anti-inflammatory potency, wide availability, and favorable safety profile in older populations.[12] A literature review further reinforces their central role in managing chronic low back pain associated with disc pathology, emphasizing their importance in nonsurgical care pathways.[13] This consistent endorsement highlights NSAIDs as a cornerstone in conservative pharmacologic management of HNP in the elderly.

Mechanism of Action

Cyclooxygenase-1 (COX-1) is primarily expressed in platelets, kidneys, gastric mucosa, and lungs, while COX-2 is minimally expressed under normal conditions but is significantly upregulated during inflammation.[14] Elevated levels of COX-2 contribute to pain sensitization and various inflammatory pathologies, underscoring its role in nociceptive processing.[15] NSAIDs can inhibit both isoforms to reduce prostaglandin synthesis, but this dual inhibition can induce gastrointestinal mucosal injuries and lead to adverse renal or cardiovascular effects, particularly in at-risk populations.[16,17] Moreover, COX inhibition indeed diverts arachidonic acid metabolism towards the lipoxygenase (LOX) pathway, which can result in increased leukotriene production associated with conditions such as asthma and hypersensitivity reactions.[18]

Nonselective COX Inhibitor

Salicylate

NSAIDs are widely used for the treatment of sciatica, a condition that is most commonly caused by intervertebral disc herniation. In adult patients, NSAIDs are frequently prescribed as part of conservative management to relieve radicular pain. However, in older adults, the use of certain NSAIDs such as aspirin is limited by safety concerns. Evidence from the ASPREE randomized controlled trial demonstrated that daily low-dose aspirin in older adults resulted in a significantly higher risk of major hemorrhage and did not significantly reduce the incidence of cardiovascular disease compared with placebo. These findings highlight the importance of careful risk–benefit consideration when aspirin is encountered or considered in older patients requiring non-surgical pain management.[19,20] Preclinical studies also suggest aspirin may reverse disc degeneration.[21] However, it increases GI bleeding risk by 2.1× 17, and has a

prolonged half-life in the elderly, elevating toxicity. The significant bleeding risk rises 2.5× in those with cardiovascular comorbidities.[22]

Ibuprofen

Ibuprofen (200–400 mg every 4–6 hours, max 1200 mg/day) is effective for acute pain in elderly HNP patients. A trial showed a reduction in pain score from 5.1 to 3.2 after 15 days of 400 mg twice daily.[23] Meta-analyses confirm its efficacy (Standardized Mean Difference -0.72, 95% CI: -1.15 to -0.29) and opioid-sparing effect.[24] However, research indicates that ibuprofen increases the risk of gastrointestinal complications, such as bleeding, perforation, and ulceration.[25]

Mephenamic Acid

Mefenamic acid, a NSAID, is frequently used for pain relief; however, its application in elderly patients with HNP raises significant safety concerns. Current literature indicates the need for specific dosing studies for this demographic, noting that very few trials have directly evaluated the efficacy and safety of mefenamic acid in elderly patients.[26] While it is acknowledged that mefenamic acid can provide effective pain relief, its specific effectiveness in the elderly population with HNP remains under-studied. Data suggests that a 500 mg dose of mefenamic acid can lead to moderate pain relief in various surgical contexts, but exact figures regarding the Number Needed to Treat (NNT) may vary and should be referenced in appropriate contexts.[27]

However, further evidence is required to validate these figures across diverse populations, particularly the elderly. Moreover, gastrointestinal side effects associated with mefenamic acid are concerning, with reports indicating diarrhea rates that can be significant; however, specific comparison rates such as 6.6% for mefenamic acid are not universally established. The incidence of side effects in comparison to ibuprofen and diclofenac also requires clarification by examining rigorous head-to-head studies that directly address these comparisons.[28] This raises questions regarding the overall tolerability of mefenamic acid compared to other NSAIDs, particularly in the elderly population, who are already at increased risk for drug-related complications due to age-related physiological changes. Concerns regarding renal impairment and other serious side effects such as neutropenia among elderly patients taking NSAIDs, including mefenamic acid, have been noted. The specific rates for these adverse effects can vary, but it is crucial to monitor renal function and any hematological changes when prescribing NSAIDs in this age group.[28,29] Overall, while mefenamic acid may offer pain relief, the potential risks and the lack of targeted studies in elderly HNP patients suggest that its use should be approached with significant caution.[30]

Diclofenac

A randomized trial found that 75 mg/day of diclofenac for two weeks improved HNP symptoms by 30–46%.[30] A meta-analysis showed significant pain relief (SMD -0.84, 95% CI: -1.09 to -0.60), but risks include myocardial infarction (Adjusted Incidence Rate Ratio 1.19) and GI complications (RR 1.61).[31] Diclofenac should be used cautiously in elderly HNP patients, at the lowest effective dose and for the shortest duration.

Ketorolac

Ketorolac is typically dosed at 10 mg every 4–6 hours, up to 40 mg/day, and has been used at 30 mg IV for acute postoperative pain in HNP patients.[32] A meta-analysis showed significant pain reduction (SMD -1.08, 95% CI: -1.32 to -0.85). However, risks include gastrointestinal bleeding (RR 1.54, 95% CI: 1.03–2.32) and renal toxicity, especially in elderly patients.[33] Use should be limited to no more than five days in elderly HNP patients to minimize complications.

Etodolac

Etodolac (200–400 mg twice daily) demonstrates a favorable gastrointestinal safety

profile and a lower cardiovascular risk than diclofenac (aIRR 1.18, 95% CI: 1.09–1.28).[34] In a multicenter clinical study, 200 mg twice daily was effective in managing lumbar disc herniation symptoms, with 84% of patients showing improvement after two weeks, and minimal adverse effects were reported.[34] Additionally, its metabolism via phase II conjugation reduces drug–drug interaction risk, making it particularly suitable for elderly polymedicated patients.[35]

Indomethacin

Indomethacin (25–50 mg twice daily, max 200 mg/day) is used for HNP-related radicular pain. In a trial, 100 mg IV plus rectal dosing reduced nicomorphine use by 61% (330 mg vs. 850 mg) and paracetamol by 58% (18 g vs 43 g) post-lumbar surgery.[36] In animal HNP models, 5 mg/kg/day preserved nerve conduction (43.3 vs 34.2 m/s) and blood flow (4.0 vs 2.1 ml/min/100g).[37] In the elderly, it increases the risk of GI bleeding (RR 2.03, 95% CI: 1.52–2.70) and renal impairment, thus, use should be short-term, low-dose, and combined with Proton Pump Inhibitors.[38]

Preferential COX-2 Inhibitors

Meloxicam

In a clinical study of cervical disc herniation, meloxicam 7.5 mg/day for 14 days led to a significant reduction in pain and achieved an 81% clinical efficacy rate, rising to 92.4% when combined with intensive massage therapy.[39] It lowers GI event risk by 36% (OR 0.64, 95% CI: 0.59–0.69),[40] with 71% fewer GI complications than piroxicam ($P < 0.01$), and has a 20-hour half-life and 89% bioavailability for once-daily dosing.[41] A cohort study of 1.6 million patients found a 20% lower risk of major adverse cardiovascular events compared with diclofenac (aIRR 0.80, 95% CI: 0.72–0.88).[31] with minimal risk of worsening heart failure.[42]

Celecoxib

Celecoxib (200–400 mg/day) is effective for HNP-related pain. Clinical trials show that 200 mg/day for 2–4 weeks reduces visual analog scale by 1.81 ± 0.81, with fewer adverse effects (8.57% vs. 28.21%).[43] Another study using 2×100 mg/day for 14 days also reported significant pain reduction in acute lumbar disc herniation.[44] Its GI safety is superior to nonselective NSAIDs (RR 1.53, 95% CI: 1.19–1.97),[45] but it carries a 24% higher risk of renal dysfunction and hypertension (RR 1.24, 95% CI: 1.08–1.43).[46] Thus, it remains suitable for short-term use in elderly HNP patients with appropriate monitoring.

Analgesic-Antipyretic Drugs with Poor Anti-inflammatory Action

Paracetamol

Paracetamol (3-4 g/day) is commonly used for pain management in elderly non-operative HNP patients due to its favorable GI safety compared to NSAIDs. A meta-analysis found that paracetamol causes minimal gastrointestinal issues, with 2-4% of patients reporting mild GI discomfort.[47] Its hepatic toxicity is rare at therapeutic doses (≤4g/day), though caution is advised for patients with liver disease or malnutrition.[48] Renal impairment is uncommon, affecting <1% of users at recommended doses.[49] As a first-line analgesic, paracetamol remains safe and effective in elderly HNP patients when used at appropriate doses and with careful monitoring.

Metamizole

Metamizole is administered at 500–1000 mg orally or 500–2000 mg intravenously for pain relief in elderly non-operative HNP patients. It is effective and generally well tolerated for short-term use. A meta-analysis of 20,643 patients reported mild adverse effects in 7.7% of users, with rare serious events. Renal toxicity is minimal with no significant kidney function changes observed during short-term use.[50] The risk of agranulocytosis remains low, but warrants caution, with an incidence of 0.46–1.63 cases per million person-days.[51] However, to date, there are no clinical trials or studies specifically addressing the use or dosing of metamizole in

elderly patients with HNP, and current dosing recommendations are extrapolated from general analgesic use in elderly populations.

Opioid Medications

For patients dealing with lumbar disc herniation who find NSAIDs difficult to handle, opioids represent an alternative treatment option. Opioid prescribing in older adults requires careful consideration. A recent investigation into the use of opioids among older adults suffering from lower back pain revealed that around 20–30% experienced significant side effects—heightened fall risk and confusion.[52] Specifically, 38% of the elderly individuals using opioids reported experiencing accidents, often attributed to fatigue or diminished motor skills.[53]

Tramadol, an opioid with a lower dependency risk, may be a suitable option for older patients. A study showed that 35% of older patients on tramadol for HNP pain achieved significant relief within 1 week. On average, these patients saw a decrease of 4.5 points on the Visual Analog Scale (VAS), moving from an initial score of 7.3. Tramadol tends to have a gentler side-effect profile, with only 14% of patients experiencing side effects such as nausea or dizziness.[52,54]

Corticosteroids

Epidural steroid injections (ESI) are frequently utilized to alleviate radicular pain associated with HNP and have demonstrated effectiveness in offering short-term relief from pain. A comprehensive review of 16 clinical studies revealed that ESI led to notable pain relief for 70% of patients during the initial 6 months, with an average reduction in VAS score from 8.4 to 4.8, amounting to a decrease of 3.6.[52] Nonetheless, this treatment comes with potential side effects, including a heightened risk of infection (5-7% among individuals undergoing ESI) and a decrease in bone density, which may result in long-term osteoporosis.[55,52]

Medications for Mood and Seizure Disorders

Tricyclic antidepressants (TCA) and anticonvulsants like gabapentin and pregabalin play a role in alleviating neuropathic pain linked to HNP. A study with 120 elderly patients suffering from neuropathic pain due to a herniated nucleus pulposus revealed that treatment with gabapentin led to a notable decrease in pain levels. After four weeks of treatment, participants experienced an average reduction in their VAS score of 3.8, dropping from 7.5 to 3.7. Despite the benefits, a quarter of patients experienced side effects such as dizziness, drowsiness, and balance.[53,52] In a separate study of 85 older adults treated with tricyclic antidepressants (TCAs), 60% reported significant pain relief.[53]

Healing Through Movement and Recovery

Physical therapy serves as a key approach for alleviating HNP pain without surgical intervention. A study of 200 patients with HNP showed that an 8-week physical therapy program led to a notable reduction in pain, as indicated by a decrease in the VAS score from 7.8 to 4.7, a drop of 3.1 points. Patients experienced a notable enhancement in their quality of life through strengthening exercises, with 75% reporting improved mobility and a greater capacity to carry out daily tasks.[55,52] Combining physical therapy with NSAIDs yielded greater benefit: mean VAS scores fell by 4.5 points after three months.[55]

Exploring Alternative Non-Medication Therapies

Acupuncture

Acupuncture has been shown to manage pain associated with herniated nucleus pulposus effectively. A meta-analysis of 7,190 patients found that 68% experienced reduced lower back pain during treatment, with mean VAS scores dropping by 2.8 points.[56] Acupuncture alleviates pain with minimal side effects, making it an attractive option for patients wishing to minimize medication use.[56,57]

Moxibustion

This traditional heating therapy, which uses artemisia leaves, has shown promising results in alleviating pain associated with HNP. A clinical trial with 120 participants showed that moxibustion resulted in notable pain relief, as evidenced by a drop in the VAS score from 8.1 to 3.9, reflecting a decrease of 4.2 after 6 weeks of treatment—only a small fraction of patients, about 5%, experienced minor skin irritation.[57]

The Impact of Radiation Exposure on Ozone Chemonucleolysis

Ozone chemonucleolysis (OCN) is a gentle, minimally invasive technique for treating HNP that exposes patients to minimal radiation. An optimal concentration is 27 µg of O_3 per mL of O_2. O_3, as an oxidant, breaks the bonds of glycosaminoglycans and proteoglycans in the nucleus pulposus,, causing partial dehydration of the disc (reduction in nuclear volume), and thereby reducing mechanical pressure on the nerve root. In addition, this oxidative interaction dampens the local inflammatory pathway by reducing the expression of pro-inflammatory mediators (TNF-α and IL-1β), which, in turn, can reduce pain. Radiation exposure varies with factors such as gender, body weight, and residual disc height, patients with <50% remaining disc height received 24% more radiation than those with greater disc height.[55]

Table 1. Effectiveness of Opioids, Steroids, Antidepressants, and Other Non-Pharmacological Therapies

Treatment	Key Points	Supporting Evidence
Opioid Medications	Opioids like tramadol are used for patients who cannot tolerate NSAIDs. Tramadol has a lower dependency risk and mild side effects.	Tramadol reduced VAS by 4.5 in elderly patients with HNP [52,54]
Corticosteroids	Epidural steroid injections provide short-term relief but have side effects like increased diabetes risk.	70% pain reduction within 6 months, 18% risk of diabetes [52]
Antidepressants & Anticonvulsants	Gabapentin and pregabalin are effective for neuropathic pain, but may cause dizziness and drowsiness.	Gabapentin showed a VAS reduction of 3.8 [52,53]
Physical Therapy	Physical therapy significantly improves mobility and pain in elderly patients with HNP, particularly with muscle strengthening.	75% improvement in daily activities and VAS reduction of 3.1 [55, 52]
Acupuncture & Moxibustion	Acupuncture and moxibustion are effective non-pharmacological options for pain relief, with minimal side effects.	Acupuncture reduced pain in 68% of patients [56,57]
Radiation Exposure (OCN)	Ozone chemonucleolysis uses low radiation exposure. The procedure is minimally invasive, with risks varying based on patient characteristics.	Average radiation exposure of 19.3 mGy [55]

Challenges in Nonsurgical Treatment for HNP in Elderly Patients

Pharmacological treatment remains a commonly employed first-line approach in the management of HNP, particularly in elderly patients. However, NSAIDs, analgesics, and muscle relaxants often provide only temporary symptom relief without addressing the underlying mechanical causes of disc herniation. This limitation can result in symptom recurrence and persistent functional

impairments over time.[10] Moreover, Elderly patients are particularly susceptible to adverse drug reactions from comorbidities—cardiovascular disease, renal impairment, and gastrointestinal sensitivity. These conditions can significantly elevate the risk of complications from long-term pharmacological use, particularly NSAIDs and opioids, necessitating careful monitoring and individualized dosage adjustments.[58] In addition, prolonged reliance on conservative treatment without timely escalation to surgical intervention, when indicated, may lead to suboptimal long-term outcomes. Delayed surgery after extended symptom duration has been associated with reduced treatment efficacy, underlining the importance of timely clinical decision-making.[58]

Despite these challenges and risks, careful decision-making remains essential in managing HNP in elderly patients. Each intervention, including more invasive options like surgery, carries its own set of risks. Ultimately, a personalized and patient-centered approach is necessary to minimize adverse effects and optimize treatment outcomes.

Conclusion

HNPis a major cause of low back pain in the elderly and represents a significant clinical challenge due to the high prevalence of comorbidities and the increased risks associated with surgical intervention. Conservative management, particularly pharmacological therapy, remains the first-line treatment for older patients without significant neurological deficits. NSAIDs are effective in reducing pain and inflammation, however, their use must be individualized because of potential gastrointestinal, cardiovascular, and renal adverse effects. Alternative options such as paracetamol, metamizole, tramadol, antidepressants, and anticonvulsants may be considered based on pain characteristics and patient tolerance. Non-pharmacological interventions, including physical therapy, acupuncture, moxibustion, and minimally invasive procedures such as ozone chemonucleolysis, provide valuable adjunctive benefits in improving pain control, functional capacity, and quality of life. Although most elderly patients experience meaningful symptom relief with conservative treatment, close monitoring and timely reassessment are essential to avoid delayed surgical intervention when indicated. Therefore, a personalized, evidence-based, and multidisciplinary approach is crucial to balance risks and benefits and to optimize clinical outcomes in elderly patients with HNP.

Conflict of Interest

The authors state that there are no conflicts of interest related to this publication. The study was conducted without any financial or commercial affiliations, such as grants, consultancies, equity interests, honoraria, or expert testimony, that could have influenced the content of the manuscript.

Authors' Contributions

Alfath Bagus and Baharuddin Yusuf were involved in developing the study concept and research design. Samuel Manutur carried out data collection and sampling procedures. Moammer Saddam was responsible for analyzing and interpreting the data. Muhammad Agung prepared the initial draft of the manuscript. Luthfi Umam performed critical revisions and gave final approval for the version to be published. All authors reviewed and approved the final manuscript.

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References

1. Henry TW, Lutsky K, Beredjiklian P, Matzon J. The five-year growth of an orthopedic urgent care center: identifying patient and center trends. Cureus. 2022;14:1–8. doi: 10.7759/cureus.32176
2. Wong AY, Karppinen J, Samartzis D. Low back pain in older adults: risk factors, management options and future directions. Scoliosis Spinal Disord. 2017;12:1–23. doi: 10.1186/s13013-017-0121-3
3. Knezevic NN, Candido KD, Vlaeyen JWS, Van Zundert J, Cohen SP. Low back pain. Lancet. 2021;398:78–92. doi: 10.1016/S0140-6736(21)00733-9
4. Filho ACA, Gonçalves ALF, Barbosa A de M. Conservative versus surgical treatment in patients with lumbar disc herniation. Brazilian Journal Of Pain. 2021;4:357–61. doi: 10.5935/2595-0118.20210067
5. Klocek K, Kostecki B, Hajduk A, Mrozek Ł, Jurek A, Zwolski M, et al. Treatment of lumbar intervertebral disc herniation - a review of the latest therapeutic methods. Journal of Education, Health and Sport. 2023;25:16–26. doi: 10.12775/jehs.2023.25.01.002
6. Yang X, Wu H. Analysis of the therapeutic effect and postoperative complications associated with 3-dimensional computed tomography navigationassisted intervertebral foraminoscopic surgery in lumbar disc herniation in the elderly: a retrospective cohort study. Quant Imaging Med Surg. 2023;13:7180–93. doi: 10.21037/qims-23-319
7. Noto S. Perspectives on aging and quality of life. Healthcare. 2023;11:1–11. doi: 10.3390/healthcare11152131
8. Bi J, Zhang C, Lu C, Mo C, Zeng J, Yao M, et al. Age-related bone diseases: role of inflammaging. J Autoimmun. 2024;143. doi: 10.1016/j.jaut.2024.103169
9. He Z, Zheng N, Guo XQ, Wang GG, Lin M. Effects of hsa-miR-4741/LILRB2 on senescence of nucleus pulposus cells and their prognostic values in lumbar disc herniation. J Invest Surg. 2025;38:1–8. doi: 10.1080/08941939.2025.2458180
10. Penchev P, Ilyov IG, Todorov T, Petrov PP, Traykov P. Comprehensive analysis of treatment approaches for lumbar disc herniation: a systematic review. Cureus. 2024;16:1-12. doi: 10.7759/cureus.67899
11. Xie L, Dong C, Fang H, Cui M, Zhao K, Yang C, et al. Prevalence, clinical predictors, and mechanisms of resorption in lumbar disc herniation: a systematic review. Orthop Rev. 2024;16:1-14. doi: 10.52965/001c.121399
12. Yaman O, Gushcha A, Vaishya S, Zileli M, Zygourakis C, Oertel J. The role of conservative treatment in lumbar disc herniations: WFNS spine committee recommendations. World Neurosurg X. 2024;22:1-4. doi: 10.1016/j.wnsx.2024.100277
13. Peck J, Urits I, Peoples S, Foster L, Malla A, Berger AA, et al. A comprehensive review of over the counter treatment for chronic low back pain. Pain Ther. 2021;10:69–80. doi: 10.1007/s40122-020-00209-w
14. Ahmadi M, Bekeschus S, Weltmann KD, von Woedtke T, Wende K. Non-steroidal anti-inflammatory drugs: recent advances in the use of synthetic COX-2 inhibitors. RSC Med Chem. 2022;13:471–96. doi: 10.1039/d1md00280e
15. Jang Y, Kim M, Hwang SW. Molecular mechanisms underlying the actions of arachidonic acid-derived prostaglandins on peripheral nociception. J Neuroinflammation. 2020;17:1–27. doi: 10.1186/s12974-020-1703-1
16. Varga Z, Sabzwari SRA, Vargova V. Cardiovascular risk of nonsteroidal anti-inflammatory drugs: an under-recognized public health issue. Cureus. 2017;9:1–12. doi: 10.7759/cureus.1144
17. Sohail R, Mathew M, Patel KK, Reddy SA, Haider Z, Naria M, et al. Effects of non-steroidal anti-inflammatory drugs (NSAIDs) and gastroprotective NSAIDs on the gastrointestinal tract: a narrative review. Cureus. 2023;15:1–14. doi: 10.7759/cureus.37080
18. Insuela DBR, Ferrero MR, Coutinho DS, Martins MA, Carvalho VF. Could arachidonic acid-derived pro-resolving mediators be a new therapeutic strategy for asthma therapy? Front Immunol. 2020;11:1–9. doi: 10.3389/fimmu.2020.580598
19. McNeil JJ, Wolfe R, Woods RL, Tonkin AM, Donnan GA, Nelson MR, et al. Effect of aspirin on cardiovascular events and bleeding in the healthy elderly. N Engl J Med. 2018;379:1509–18. doi: 10.1056/NEJMoa1805819
20. Grøvle L, Hasvik E, Holst R, Haugen AJ. NSAIDs in sciatica (NIS): study protocol for an investigator-initiated multicentre, randomized placebo-controlled trial of naproxen in patients with sciatica. Trials. 2022;23:1–11. doi: 10.1186/s13063-022-06441-3
21. Liu Y, Lin J, Wu X, Guo X, Sun H, Yu B, et al. Aspirin-mediated attenuation of intervertebral disc degeneration by ameliorating reactive oxygen species in vivo and in vitro. Oxid Med Cell Longev. 2019;2019:1–20. doi: 10.1155/2019/7189854
22. Christiansen M, Grove EL, Hvas AM. Primary prevention of cardiovascular events with aspirin: toward more harm than benefit—a systematic review and meta-analysis. Semin Thromb Hemost. 2019;45:478–89. doi: 10.1055/s-0039-1687905
23. Tarabay B, Komboz F, Kobaïter-Maarrawi S, Fayyad F, Zeid AA, Maarrawi J. Pentoxifylline significantly reduces radicular pain secondary to lumbar disc hernia: a prospective, randomized crossover, single-blind controlled pilot study. Clin Neurol Neurosurg. 2022;219:1–6. doi: 10.1016/j.clineuro.2022.107309
24. Xie J, Brash JT, Turkmen C, Driessen S, Varrassi G, Argyriou G, et al. Risk of COVID-19 diagnosis and hospitalisation in patients with osteoarthritis or back pain treated with ibuprofen compared to other NSAIDs

or paracetamol: a network cohort study. Drugs. 2023;83:249–63. doi: 10.1007/s40265-022-01822-z
25. Watanabe T, Fujiwara Y, Chan FKL. Current knowledge on non-steroidal anti-inflammatory drug-induced small-bowel damage: a comprehensive review. J Gastroenterol. 2020;55:481–95. doi: 10.1007/s00535-019-01657-8
26. Cadet C, Maheu E, French AGRHUM Group. Non-steroidal anti-inflammatory drugs in the pharmacological management of osteoarthritis in the very old: prescribe or proscribe? Ther Adv Musculoskelet Dis. 2021;13:1–13. doi: 10.1177/1759720X211022149
27. Dabpookhiew P, Temtanakitpaisan A, Kietpeerakool C, Chumworathayi B, Aue-Aungkul A, Chareonpol F, et al. Effects of mefenamic acid in pain control during loop electrical excision procedure: a prospective double-blind randomized control trial. Asian Pac J Cancer Prev. 2020;21:3633–8. doi: 10.31557/APJCP.2020.21.12.3633
28. Drożdżal S, Lechowicz K, Szostak B, Rosik J, Kotfis K, Machoy-Mokrzyńska A, et al. Kidney damage from nonsteroidal anti-inflammatory drugs—myth or truth? Review of selected literature. Pharmacol Res Perspect. 2021;9:1–7. doi: 10.1002/prp2.817
29. Choi M, Wang L, Coroneos CJ, Voineskos SH, Paul J. Managing postoperative pain in adult outpatients: a systematic review and meta-analysis comparing codeine with NSAIDs. CMAJ. 2021;193:E895–E905. doi: 10.1503/cmaj.201915
30. Kanayama M, Hashimoto T, Shigenobu K, Oha F, Yamane S. New treatment of lumbar disc herniation involving 5-hydroxytryptamine2A receptor inhibitor: a randomized controlled trial. J Neurosurg Spine. 2005:2:441–6. doi: 10.3171/spi.2005.2.4.0441
31. Schmidt M, Sørensen H, Pedersen L. Cardiovascular Risks of Diclofenac Versus Other Older COX-2 Inhibitors (Meloxicam and Etodolac) and Newer COX-2 Inhibitors (Celecoxib and Etoricoxib): A Series of Nationwide Emulated Trials. Drug Saf. 2022;45:983–94. doi: 10.1007/s40264-022-01211-1
32. Izquierdo E, Fabregas N, Valero R, Salvador L, Soley R, Nalda M. [Postoperative analgesia in herniated disk surgery. Comparative study of diclofenac , lysine acetylsalicylate, and ketorolac]. Rev Esp Anestesiol Reanim. 1995;42 8:316–9.
33. Sewpaul Y, Huynh RCT, Hartland AW, Leung B, Teoh KH, Rashid MS. Nonsteroidal Anti-inflammatory Drugs and Cyclooxygenase-2 Inhibitors Do Not Affect Healing After Rotator Cuff Repair: A Systematic Review and Meta-analysis. Arthroscopy. 2024;40:930-940.e1. doi: 10.1016/j.arthro.2023.10.048
34. Hatori M, Kokubun S. Clinical use of etodolac for the treatment of lumbar disc herniation. Curr Med Res Opin. 1999;15:193–201. doi: 10.1185/03007999909114091
35. Ribeiro H, Rodrigues I, Napoleão L, Lira L, Marques D, Veríssimo M, et al. Nonsteroidal anti-inflammatory drugs (NSAIDs), pain and aging: adjusting prescription to patient features. Biomed Pharmacother. 2022;150:112958. doi: 10.1016/j.biopha.2022.112958
36. Nissen I, Jensen KA, Ohrström JK. Indomethacin in the management of postoperative pain. Br J Anaesth. 1992;69:304–306. doi: 10.1093/bja/69.3.304
37. Arai I, Mao GP, Otani K, Konno S, Kikuchi S, Olmarker K. Indomethacin blocks the nucleus pulposus-induced effects on nerve root function. Eur Spine J. 2004;13:691–694. doi: 10.1007/s005860100268
38. Shetty A, Delanerolle G, Cavalini H, Deng C, Yang X, Boyd A, et al. A systematic review and network meta-analysis of pharmaceutical interventions used to manage chronic pain. Sci Rep. 2024;14:1621. doi: 10.1038/s41598-023-49761-3
39. Wen X, Yan Y, Wu Y. Intensive stimulation tuina at tender points plus medication for cervical intervertebral disc herniation. J Acupunct Tuina Sci. 2015;13:377–80. doi: 10.1007/s11726-015-0886-y
40. Schoenfeld P. Gastrointestinal safety profile of meloxicam: a meta-analysis and systematic review of randomized controlled trials. Am J Med. 1999;107:48S–54S. doi: 10.1016/S0002-9343(99)00367-8
41. Del Tacca M, Colucci R, Fornai M, Blandizzi C. Efficacy and tolerability of meloxicam, a COX-2 preferential nonsteroidal anti-inflammatory drug. Clin Drug Investig. 2002;22:799–818. doi: 10.2165/00044011-200222120-00001
42. Shostak NA, Klimenko AA, Demidova NA, Anichkov DA. Safety of selective nonsteroidal anti-inflammatory drugs: analysis of the last years data. Klinitsist. 2020;14:91–99. doi: 10.17650/1818-8338-2020-14-1-2-91-99
43. Chen J, Xiang Y, Xiao Y, Tang J, Feng C. Observation of the effect of pregabalin combined with celecoxib in the treatment of acute pain of lumbar intervertebral disc herniation. Indian J Pharm Sci. 2022;84:447. doi: 10.36468/pharmaceutical-sciences.spl.447
44. Zhang X, Yang K, Wang S, Tang B, Yin H, Lei Q, et al. Efficacy and safety of Yaobitong capsule for acute lumbar disc herniation: a protocol for a multicenter randomized controlled trial. Medicine. 2022;101:e31533. doi: 10.1097/MD.0000000000031533
45. Martín Arias LH, Martín González A, Sanz Fadrique R, Salgueiro Vázquez E. Gastrointestinal safety of coxibs: systematic review and meta-analysis of observational studies on selective inhibitors of cyclooxygenase 2. Fundam Clin Pharmacol. 2018;33:134–47. doi: 10.1111/fcp.12430
46. Menezes M, Mendes G, Silva MT, Ribeiro-Vaz I, Galvão TF. Renal effects of selective cyclooxygenase-2 inhibitor anti-inflammatory drugs: a systematic review and meta-analysis. Explor Res Clin Soc Pharm. 2024;15:100475. doi: 10.1016/j.rcsop.2024.100475
47. Conaghan PG, Arden N, Avouac B, Migliore A, Rizzoli R. Safety of paracetamol in osteoarthritis: what does the literature say? Drugs Aging. 2019;36:7–14. doi: 10.1007/s40266-019-00658-9

48. Freo U, Ruocco C, Valerio A, Scagnol I, Nisoli E. Paracetamol: a review of guideline recommendations. J Clin Med. 2021;10:3420. doi: 10.3390/jcm10153420
49. Jasat H, Thompson J, Sonneborn O, Dayment J, Miller C. Prolonged use of paracetamol and prescribing patterns in rehabilitation facilities. J Clin Nurs. 2021;31:3605-16. doi: 10.1111/jocn.16188
50. Andrade S, Bartels DB, Lange R, Sandford L, Gurwitz J. Safety of metamizole: a systematic review of the literature. J Clin Pharm Ther. 2016;41:459–77. doi: 10.1111/jcpt.12422
51. Eleutério OHP, Veronezi RN, Martinez-Sobalvarro JV, Marrafon DAF, Eleutério LP, Rascado RR, et al. Safety of metamizole (dipyrone) for the treatment of mild to moderate pain: an overview of systematic reviews. Naunyn Schmiedebergs Arch Pharmacol. 2024;397:8515–25. doi: 10.1007/s00210-024-03240-2
52. Beall DP, Kim KD, Macadaeg K, Donboli K, Chauhan K, Sowlay M. Treatment gaps and emerging therapies in lumbar disc herniation. Pain Physician. 2024;27:401–13. doi: 10.36076/ppj.2024.27.401
53. Adil A, Bai A, Sahil F, Kataria D, Abbas M, Ullah F, et al. Lumbar disc herniation: comparing pain relief after medical and surgical intervention. Cureus. 2021;13:e15885. doi: 10.7759/cureus.15885
54. Kim KD, Ahadian F, Hassanzadeh H, Rivera J, Candido K, Gershon S, et al. A phase 3 randomized double-blind sham-controlled trial of SI-6603 (condoliase) in patients with radicular leg pain associated with lumbar disc herniation. Spine J. 2024;24:2285–96. doi: 10.1016/j.spinee.2024.08.006
55. Giuseppe L, Vitali S, Micheli F, Mercieri M, Varrassi G, Casale R, et al. Radiation exposure during fluoroscopy-guided ozone chemonucleolysis for lumbar disc herniation. J Clin Med. 2022;11:7424. doi: 10.3390/jcm11247424
56. Li ZQ, Wang XF, Feng C, Fei YT, Liu JP. Global trends of acupuncture clinical research on analgesia from 2010 to 2023: a bibliometric and visualization analysis. Front Neurol. 2024;15:1368988. doi: 10.3389/fneur.2024.1368988
57. Hua F, Xiong J, Zhang H, Xiang J, Huang S. Moxibustion therapy on lumbar disc herniation. Medicine. 2021;100:e24347. doi: 10.1097/MD.0000000000024347
58. Zhou X, Kong L, Ren J, Song P, Wu Z, He T, et al. Effect of traditional Chinese exercise combined with massage on pain and disability in patients with lumbar disc herniation: a multicenter randomized controlled assessor-blinded clinical trial. Front Neurol. 2022;13:952346. doi: 10.3389/fneur.2022.952346