Current Evidence on Conventional Radiofrequency Denervation versus Medial Branch Block in Chronic Lumbar Facet Joint Pain

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Abstract

Background: Chronic lumbar facet joint pain is a major contributor to chronic low back pain and represents a significant source of disability, impaired functional capacity, and reduced quality of life worldwide. Lumbar facet joints account for approximately 15–45% of cases of chronic axial low back pain, yet accurate diagnosis remains challenging because of overlapping clinical manifestations with other spinal pain generators, including intervertebral discs, sacroiliac joints, and paraspinal structures. Diagnostic medial branch block has become the accepted reference standard for identifying facet-mediated pain, while interventional procedures have gained increasing importance in patients who fail conservative management. Among these interventions, medial branch block and conventional medial branch radiofrequency denervation are the two most widely utilized techniques; however, their relative efficacy, durability of pain relief, and optimal clinical role continue to be subjects of ongoing debate.

Objective: This review aims to critically evaluate the current evidence comparing conventional medial branch radiofrequency denervation and medial branch block for the management of chronic lumbar facet joint pain. The review focuses on lumbar facet joint anatomy, pain mechanisms, diagnostic strategies, procedural techniques, clinical efficacy, functional outcomes, patient satisfaction, analgesic requirements, safety profile, and current evidence supporting each intervention. Particular emphasis is placed on the role of appropriate patient selection and diagnostic medial branch block in optimizing treatment outcomes.

Methods: A comprehensive narrative review was conducted using the literature incorporated within the current review framework. Evidence was synthesized to provide an integrated overview of lumbar facet joint anatomy, pathophysiology, diagnosis, conservative treatment, medial branch block, conventional radiofrequency denervation, and comparative clinical outcomes. The available evidence was critically analyzed to identify areas of consensus, ongoing controversies, and current limitations influencing clinical decision-making.

Conclusion: Current evidence indicates that both medial branch block and conventional medial branch radiofrequency denervation are effective interventional options for carefully selected patients with chronic lumbar facet joint pain. Medial branch block remains indispensable as a diagnostic tool and provides meaningful short-term therapeutic benefit, whereas conventional radiofrequency denervation consistently demonstrates superior durability of pain relief, greater functional improvement, reduced analgesic consumption, and higher patient satisfaction during medium-term follow-up. Optimal outcomes depend on accurate diagnosis, meticulous procedural technique, and appropriate patient selection. Although the available evidence increasingly favors conventional radiofrequency denervation as the preferred definitive intervention following a positive diagnostic medial branch block, further high-quality randomized studies with standardized protocols and long-term follow-up are required to refine patient selection criteria, establish optimal treatment algorithms, and evaluate the long-term effectiveness of repeated radiofrequency procedures. ***Keywords:*** Chronic lumbar facet joint pain; medial branch block; conventional radiofrequency denervation.

Introduction

Chronic low back pain remains one of the most important causes of disability worldwide and represents a major clinical challenge for anesthesiologists and pain physicians. Its burden is not limited to pain intensity alone, but extends to impaired mobility, reduced work capacity, psychological distress, analgesic dependence, and recurrent healthcare utilization. Although low back pain may arise from several spinal and extraspinal structures, persistent axial lumbar pain is most commonly attributed to intervertebral discs, sacroiliac joints, and lumbar facet joints. The clinical overlap between these pain generators often makes diagnosis difficult, and this uncertainty explains why interventional diagnostic techniques are frequently required before definitive treatment is selected [1].

Lumbar facet joints, also known as zygapophyseal joints, are paired synovial joints that contribute to posterior spinal stability and guide segmental lumbar motion. Their capsule, synovium, subchondral bone, and periarticular tissues are richly innervated, making them capable of generating nociceptive pain when exposed to degeneration, inflammation, capsular strain, synovitis, or abnormal mechanical loading. Facet-mediated pain is usually axial, deep, aching, and paraspinal, with possible referral to the buttock or thigh but typically without a true radicular pattern. Controlled diagnostic studies have estimated that lumbar facet joints may account for approximately 15–45% of chronic low back pain cases, highlighting their importance as a therapeutic target in pain practice [2].

The anatomical basis of lumbar facet pain is directly related to medial branch innervation. Each lumbar facet joint receives dual segmental innervation from the medial branches of the dorsal rami at the same level and the level above. This arrangement has two major clinical implications: first, accurate diagnosis usually depends on selectively blocking the relevant medial branches rather than relying only on imaging or clinical examination; second, effective denervation requires precise targeting of all medial branches supplying the painful joint. Therefore, a detailed understanding of medial branch anatomy is essential for both medial branch block and conventional radiofrequency denervation [3].

Diagnosis of lumbar facet joint pain remains challenging because no single historical feature, physical sign, or radiological finding is sufficiently specific. Imaging may demonstrate facet degeneration, hypertrophy, effusion, osteophytes, or synovial cysts, yet similar findings are frequently observed in asymptomatic individuals. Consequently, imaging is best regarded as a supportive tool that helps exclude alternative causes and define anatomy rather than as a definitive diagnostic test. In current interventional pain practice, diagnostic medial branch block is considered the most clinically useful method for confirming facet-mediated pain, particularly when it produces meaningful temporary pain relief consistent with the expected duration of the local anesthetic [4].

Medial branch block has both diagnostic and therapeutic value. By delivering local anesthetic, often combined with corticosteroid, around the medial branch nerves, it can temporarily interrupt nociceptive transmission from the painful facet joint and reduce local inflammatory contributions. This technique is relatively simple, repeatable, and widely used, especially in patients who are poor candidates for more definitive procedures or in whom a diagnostic step is required before radiofrequency treatment. However, the duration of benefit after medial branch block is usually limited by the pharmacological action of the injected agents, and recurrence of pain commonly necessitates repeat injections or escalation to neuroablative therapy [5].

Conventional medial branch radiofrequency denervation was developed to provide longer-lasting analgesia by thermally interrupting nociceptive conduction through the medial branch nerves. In contrast to medial branch block, which temporarily suppresses neural transmission, conventional radiofrequency produces controlled thermal lesions around the target nerve, aiming to prolong pain relief while preserving overall spinal stability. The effectiveness of this technique depends on careful patient selection, positive diagnostic block response, correct needle orientation, adequate sensory and motor stimulation, and appropriate lesion parameters. When these technical principles are respected, radiofrequency denervation may provide more sustained pain relief and functional improvement than injection therapy alone [6].

Despite the widespread use of both interventions, the relative role of medial branch block and conventional radiofrequency denervation remains debated. Some studies support medial branch block as a useful and less invasive therapeutic option, particularly for short-term relief, whereas others demonstrate superior medium-term outcomes with radiofrequency denervation in terms of pain reduction, disability improvement, satisfaction, and reduced analgesic consumption. Variability in diagnostic criteria, block thresholds, number of diagnostic blocks, lesion technique, follow-up duration, and outcome measures has contributed to heterogeneity across the literature and has made direct comparison difficult [7].

Therefore, this review aims to evaluate the current evidence on conventional medial branch radiofrequency denervation versus medial branch block for chronic lumbar facet joint pain. It will discuss the anatomical and pathophysiological basis of facetogenic pain, diagnostic challenges, procedural principles, comparative clinical outcomes, safety considerations, and current controversies. From an anesthesia and pain management perspective, the central clinical question is not whether both techniques can reduce pain, but which intervention provides the most durable and meaningful benefit for carefully selected patients with confirmed lumbar facet-mediated pain [8].

Anatomy of the Lumbar Facet Joint and Medial Branch Innervation

The lumbar spine is designed to combine axial load transmission, segmental mobility, and neural protection. Each lumbar vertebra consists of an anterior vertebral body that primarily bears weight and a posterior neural arch formed by pedicles, laminae, transverse processes, spinous process, and superior and inferior articular processes. The intervertebral discs, vertebral bodies, ligaments, paraspinal muscles, and posterior elements function together as an integrated motion segment. Within this architecture, the facet joints provide posterior column support and regulate movement, especially extension, rotation, and shear forces, making them highly relevant to chronic mechanical low back pain [9].

The lumbar facet joints are true synovial diarthrodial joints located posterolaterally between adjacent vertebrae. Each joint is formed by the inferior articular process of the upper vertebra and the superior articular process of the lower vertebra. The articular surfaces are covered by hyaline cartilage and enclosed by a fibrous capsule lined by synovium. These joints also contain synovial folds or meniscoid structures, which may contribute to mechanical irritation or painful locking in selected cases. Their orientation varies across lumbar levels, allowing flexion and extension while limiting excessive rotation and translation [10].

From a pain medicine perspective, the facet joint capsule is clinically important because it is richly innervated and mechanically sensitive. Degenerative changes, capsular distension, synovitis, osteophyte formation, cartilage loss, and abnormal loading may activate nociceptors within the capsule and periarticular tissues. The lower lumbar levels are particularly vulnerable because they carry greater axial load and are exposed to higher mechanical stress during daily movement. This explains why facet degeneration and facet-mediated pain are commonly encountered at L4–L5 and L5–S1 in clinical practice [11].

The sensory supply of the lumbar facet joints is derived mainly from the medial branches of the dorsal rami. After the spinal nerve exits the intervertebral foramen, it divides into ventral and dorsal rami; the dorsal ramus then gives medial, intermediate, and lateral branches. The medial branch courses around the junction between the transverse process and the superior articular process, closely related to the bony target used during fluoroscopic medial branch block and radiofrequency denervation. This predictable relationship between nerve and bone makes image-guided intervention possible [12].

Each lumbar facet joint receives dual innervation from two adjacent medial branches: one from the same vertebral level and another from the level above. For example, the L4–L5 facet joint is supplied by the L3 and L4 medial branches. The L5–S1 joint is anatomically distinct because its innervation includes the L5 dorsal ramus, which runs in the groove between the sacral ala and the superior articular process of the sacrum. This dual innervation is essential when planning treatment because incomplete blockade or incomplete lesioning may lead to inadequate analgesia or early recurrence [13].

This anatomical arrangement explains the procedural logic behind both medial branch block and conventional radiofrequency denervation. A medial branch block must anesthetize all nerves supplying the suspected painful joint to provide a valid diagnostic response, while radiofrequency denervation must create lesions at each relevant medial branch to interrupt nociceptive input effectively. Therefore, successful treatment of lumbar facet joint pain is not simply an injection technique; it is an anatomy-driven intervention requiring precise level selection, accurate fluoroscopic targeting, and awareness of normal and variant medial branch pathways [14].

Pathophysiology of Chronic Lumbar Facet Joint Pain

Lumbar facet joint pain develops through a complex interaction between mechanical loading, degenerative changes, inflammation, and neural sensitization. Unlike acute injury, chronic facet-mediated pain is characterized by persistent nociceptive stimulation resulting from progressive structural deterioration of the joint. Repetitive spinal motion, age-related degeneration, obesity, poor posture, and altered biomechanics increase stress across the posterior spinal elements, promoting cartilage degeneration and capsular injury. These pathological changes activate peripheral nociceptors and initiate pain signaling through the medial branch nerves, ultimately contributing to persistent axial low back pain [15].

Degenerative osteoarthritis is the most common pathological process affecting the lumbar facet joints. Progressive cartilage thinning exposes the subchondral bone to increased mechanical forces, resulting in sclerosis, osteophyte formation, joint space narrowing, and capsular thickening. Synovial inflammation frequently accompanies these structural abnormalities, leading to the release of inflammatory mediators such as prostaglandins, cytokines, and neuropeptides that further sensitize peripheral nociceptors. Consequently, even normal physiological movement may become painful because of lowered activation thresholds within the affected joint tissues [16].

Mechanical instability also plays a significant role in the development of facetogenic pain. Degeneration of the intervertebral disc alters normal load distribution within the spinal motion segment, shifting greater compressive forces to the facet joints. This increased posterior loading accelerates facet degeneration and perpetuates a cycle of abnormal biomechanics and chronic inflammation. Segmental instability may additionally produce repetitive capsular stretching, which is highly nociceptive because the joint capsule contains abundant mechanoreceptors and free nerve endings responsive to tensile stress [17].

Persistent nociceptive input from degenerated facet joints may induce peripheral and central sensitization, transforming localized mechanical pain into chronic pain that is disproportionate to structural abnormalities. Peripheral sensitization results from continuous inflammatory stimulation of nociceptors, whereas central sensitization involves enhanced excitability of neurons within the dorsal horn of the spinal cord and higher pain-processing centers. Patients therefore may experience hyperalgesia, prolonged pain after movement, and reduced pain thresholds despite relatively modest imaging findings. These neurophysiological changes help explain why chronic lumbar facet pain often persists even after the initial mechanical insult has stabilized [18].

The multifactorial nature of lumbar facet pain explains why clinical presentation is frequently heterogeneous. Patients typically report chronic axial low back pain aggravated by lumbar extension, prolonged standing, rotation, or rising from a seated position, while neurological deficits are usually absent unless concomitant spinal pathology exists. Pain may refer to the buttock, groin, or posterior thigh without following a dermatomal distribution, reflecting convergence of nociceptive afferents within the spinal cord. This overlap with discogenic and sacroiliac joint pain limits the diagnostic value of symptoms and physical examination alone [19].

Understanding the underlying pathophysiology provides the rationale for current interventional treatments. Medial branch block temporarily interrupts nociceptive transmission and may reduce inflammation through local anesthetics and corticosteroids, whereas conventional radiofrequency denervation aims to produce sustained interruption of pain signaling by thermally lesioning the medial branch nerves. Since neither technique reverses the underlying degenerative process, long-term clinical success depends on careful patient selection, accurate diagnosis, appropriate procedural technique, and comprehensive rehabilitation to address contributing biomechanical factors [20].

Diagnosis and Patient Selection

Accurate diagnosis of chronic lumbar facet joint pain is essential because no single clinical feature reliably identifies the facet joint as the primary pain generator. The diagnosis is largely based on a combination of patient history, physical examination, exclusion of alternative spinal disorders, imaging findings, and confirmatory diagnostic blocks. Since symptoms frequently overlap with discogenic, sacroiliac, and myofascial pain syndromes, reliance on clinical assessment alone may result in inappropriate patient selection and suboptimal outcomes following interventional procedures [21].

Patients with facet-mediated pain typically present with chronic axial low back pain that worsens during lumbar extension, prolonged standing, spinal rotation, or transitioning from sitting to standing. Pain is often localized to the paraspinal region and may radiate to the buttocks or proximal thighs without extending below the knee or following a dermatomal pattern. Morning stiffness and pain after prolonged inactivity are common, whereas neurological deficits, sensory changes, and significant motor weakness generally suggest alternative diagnoses such as nerve root compression or spinal canal pathology [22].

Physical examination can support but not confirm the diagnosis. Local tenderness over the lumbar facet joints, pain reproduced during extension-rotation maneuvers, and reduced lumbar range of motion are frequently reported; however, these findings demonstrate limited sensitivity and specificity. Several provocative tests have been described, but none consistently distinguish facet-mediated pain from other mechanical causes of chronic low back pain. Therefore, current evidence supports using physical examination primarily to guide clinical suspicion rather than as a definitive diagnostic tool [23].

Radiological evaluation is valuable for identifying structural abnormalities and excluding competing diagnoses but correlates poorly with pain severity. Plain radiographs may demonstrate osteoarthritis, while computed tomography provides excellent visualization of osteophytes, hypertrophy, and joint degeneration. Magnetic resonance imaging allows assessment of facet joint effusion, synovitis, surrounding soft tissues, and associated spinal disorders such as disc herniation or spinal stenosis. Nevertheless, degenerative facet changes are frequently observed in asymptomatic individuals, indicating that imaging findings alone should not determine treatment decisions [24].

Diagnostic medial branch block remains the current reference standard for confirming lumbar facet joint pain. Image-guided injection of a small volume of local anesthetic around the medial branch nerves temporarily interrupts nociceptive transmission from the targeted facet joint. A substantial reduction in pain corresponding to the expected anesthetic duration supports the diagnosis of facet-mediated pain and predicts a higher likelihood of successful response to conventional radiofrequency denervation. To improve diagnostic accuracy and reduce false-positive responses, many guidelines recommend controlled or comparative medial branch blocks before proceeding to definitive neuroablative treatment [25].

Appropriate patient selection is the cornerstone of successful interventional management. Candidates for medial branch block or conventional radiofrequency denervation generally include patients with chronic axial low back pain persisting for at least three months, failure of conservative management, absence of significant neurological deficits, and positive diagnostic block findings consistent with lumbar facet-mediated pain. Careful exclusion of other pain generators, optimization of comorbid conditions, and realistic patient expectations contribute substantially to improved procedural outcomes and long-term pain management success [26].

Medial Branch Block: Technique, Mechanism, and Clinical Evidence

Medial branch block (MBB) is an image-guided interventional procedure that serves both diagnostic and therapeutic purposes in the management of chronic lumbar facet joint pain. The procedure involves injection of a small volume of local anesthetic, with or without corticosteroid, adjacent to the medial branches of the dorsal rami that innervate the suspected painful facet joints. Because these nerves transmit nociceptive signals from the facet capsule, temporary interruption of neural conduction can confirm the facet joint as the pain source while simultaneously providing short-term symptom relief. Consequently, MBB has become an integral component of the diagnostic pathway before considering more definitive interventions such as conventional radiofrequency denervation [27].

The procedure is most commonly performed under fluoroscopic guidance, although computed tomography and ultrasound guidance have also been described. Correct needle placement is achieved by targeting the medial branch at the junction of the superior articular process and the transverse process for lumbar levels L1–L4, while the L5 dorsal ramus is approached along the groove between the sacral ala and the superior articular process of the sacrum. Small injectate volumes are recommended to minimize spread to adjacent neural structures and improve diagnostic specificity. Contrast injection is frequently used before anesthetic administration to confirm accurate needle positioning and avoid inadvertent intravascular injection [28].

The mechanism of pain relief following MBB primarily depends on reversible interruption of nociceptive transmission through blockade of sodium channels within the medial branch nerves. When corticosteroids are added, suppression of local inflammatory mediators may further reduce pain originating from synovitis and periarticular inflammation. However, because the structural degeneration of the facet joint remains unchanged, analgesia is usually temporary and varies according to the pharmacological duration of the injectate, underlying disease severity, and individual patient characteristics. Repeat injections may therefore be required in selected patients experiencing recurrent symptoms [29].

Beyond its therapeutic role, MBB remains the most widely accepted diagnostic test for identifying patients likely to benefit from radiofrequency denervation. A clinically meaningful reduction in pain following appropriately performed medial branch blockade indicates that the targeted facet joint is the principal pain generator. Although the optimal threshold for defining a positive response remains controversial, higher degrees of temporary pain relief have generally been associated with improved outcomes after subsequent radiofrequency treatment. This diagnostic strategy aims to enhance patient selection and reduce unnecessary neuroablative procedures in individuals with non-facet sources of chronic low back pain [30].

Clinical studies have demonstrated that MBB can provide significant short-term improvements in pain intensity, physical function, and quality of life, particularly in carefully selected patients with confirmed facet-mediated pain. Nevertheless, the duration of benefit is often limited to several weeks or months, and repeated procedures may be required to maintain symptom control. Variability in injection technique, anesthetic selection, corticosteroid use, patient characteristics, and outcome measures has contributed to inconsistent findings across clinical trials, making comparisons between studies challenging [31].

Despite these limitations, medial branch block continues to play an essential role in contemporary pain management algorithms. It offers a minimally invasive, relatively safe, and reproducible intervention that assists both diagnosis and treatment while helping clinicians determine candidacy for conventional radiofrequency denervation. Current evidence therefore supports MBB as a valuable first-line interventional approach in appropriately selected patients, particularly when integrated within a comprehensive multidisciplinary management strategy that includes rehabilitation, exercise therapy, and patient education [32].

Conventional Radiofrequency Denervation: Technique, Mechanism, and Clinical Evidence

Conventional radiofrequency denervation (CRF), also referred to as conventional radiofrequency neurotomy or radiofrequency ablation, is an established minimally invasive procedure designed to provide prolonged pain relief in patients with chronic lumbar facet joint pain. Unlike medial branch block, which temporarily inhibits nerve conduction through local anesthetic injection, CRF applies controlled thermal energy to the medial branch nerves, producing coagulative necrosis that interrupts nociceptive transmission from the affected facet joints. Because peripheral nerves have the capacity to regenerate, pain relief is generally temporary but often lasts considerably longer than that achieved with diagnostic or therapeutic nerve blocks [33].

The procedure is usually performed under fluoroscopic guidance with the patient in the prone position. After local anesthesia of the skin and subcutaneous tissues, a radiofrequency cannula is advanced parallel to the course of the target medial branch to maximize the length of nerve exposed to thermal lesioning. Correct positioning is confirmed using multiple fluoroscopic views together with sensory and motor stimulation before lesion creation. Conventional lesion parameters commonly involve temperatures of approximately 80°C maintained for 60–90 seconds, although slight variations in technique exist among institutions. Careful adherence to procedural principles is essential to maximize lesion size while minimizing injury to adjacent neural structures [34].

The analgesic effect of CRF results from thermal interruption of afferent pain transmission through the medial branch nerves without significantly affecting spinal stability or motor function. Since the medial branches primarily provide sensory innervation to the facet joints while supplying only small branches to the multifidus muscle, selective lesioning generally preserves normal lower-limb neurological function. Pain reduction may not occur immediately after the procedure because transient post-procedural soreness can precede the onset of sustained analgesia, which often develops over several weeks as nociceptive signaling diminishes [35].

Appropriate patient selection remains the most important determinant of successful CRF outcomes. Most clinical guidelines recommend performing radiofrequency denervation only after a positive diagnostic medial branch block confirms the facet joint as the principal pain generator. Patients with chronic axial low back pain, failure of conservative treatment, and substantial temporary pain relief following diagnostic blockade consistently demonstrate better outcomes than those selected solely on the basis of symptoms or imaging findings. Consequently, diagnostic precision directly influences procedural success and long-term patient satisfaction [36].

Numerous randomized controlled trials and systematic reviews have demonstrated that CRF provides meaningful improvements in pain intensity, physical function, and health-related quality of life in appropriately selected patients. Compared with repeated injection therapy, radiofrequency denervation generally offers longer durations of analgesia, frequently extending for 6–12 months or longer before nerve regeneration permits recurrence of symptoms. Repeat radiofrequency procedures can often restore clinical benefit when pain returns, making CRF a practical option for long-term management of recurrent facet-mediated pain [37].

Although CRF is considered a safe procedure, complications may occur, particularly when technical precision is inadequate. Reported adverse events include temporary localized pain, neuritis, dysesthesia, bruising, bleeding, infection, and, rarely, injury to adjacent neural structures. Serious neurological complications are uncommon when image guidance, physiological stimulation, and standardized procedural protocols are followed. Overall, the favorable balance between sustained pain relief, functional improvement, and low complication rates has established conventional radiofrequency denervation as one of the principal interventional treatments for chronic lumbar facet joint pain after successful diagnostic medial branch block [38].

Conventional Radiofrequency Denervation versus Medial Branch Block: Comparative Clinical Evidence

Both medial branch block (MBB) and conventional radiofrequency denervation (CRF) are widely used for the management of chronic lumbar facet joint pain; however, they differ substantially in therapeutic objectives, duration of analgesia, and clinical indications. MBB primarily serves as a diagnostic procedure with the added benefit of temporary pain relief, whereas CRF is intended to provide longer-lasting interruption of nociceptive transmission after confirmation of facet-mediated pain. Consequently, comparative clinical studies have focused on determining whether the additional procedural complexity of CRF translates into superior long-term outcomes compared with repeated nerve blocks [39].

Randomized controlled trials generally demonstrate that both interventions produce significant short-term reductions in pain intensity and improvements in functional status among carefully selected patients. During the early post-procedural period, clinical outcomes may be similar because both techniques effectively interrupt pain transmission through the medial branch nerves. However, as the pharmacological effects of local anesthetics and corticosteroids diminish, patients treated with MBB frequently experience recurrence of symptoms, whereas those undergoing CRF often maintain meaningful pain relief for substantially longer follow-up periods [40].

The principal advantage of CRF lies in its durability of analgesia. Most comparative studies report superior medium- and long-term pain control, reduced disability scores, lower analgesic consumption, and higher patient satisfaction following radiofrequency denervation compared with repeated medial branch blocks. Although symptom recurrence eventually occurs because of peripheral nerve regeneration, repeat CRF procedures have consistently demonstrated effectiveness in restoring pain relief in many patients. This prolonged duration of benefit may also reduce the need for repeated healthcare visits and multiple injection procedures over time [41].

Despite these advantages, MBB continues to retain an important role in clinical practice. It is less invasive, technically simpler, associated with minimal recovery time, and particularly valuable for confirming the diagnosis before irreversible neuroablative treatment is considered. In addition, some patients who are medically frail, have contraindications to radiofrequency procedures, or prefer conservative interventional management may achieve satisfactory symptom control with periodic therapeutic medial branch blocks alone. Therefore, treatment selection should remain individualized according to patient characteristics, treatment goals, and expected duration of benefit [42].

Interpretation of the comparative literature requires careful consideration of methodological variability among published studies. Differences in diagnostic block criteria, percentage pain-relief thresholds, use of single versus dual confirmatory blocks, radiofrequency lesion parameters, follow-up duration, outcome measures, and definitions of treatment success have contributed to heterogeneity across clinical trials. These factors partly explain inconsistencies observed in pooled analyses and highlight the importance of standardized protocols in future comparative research [43].

Overall, the current body of evidence supports a stepwise treatment strategy in which diagnostic medial branch block identifies patients with facet-mediated pain who are most likely to benefit from conventional radiofrequency denervation. While MBB provides valuable diagnostic information and effective short-term symptom relief, CRF appears to offer superior long-term improvements in pain, function, and quality of life for appropriately selected patients. Accordingly, many contemporary clinical guidelines recommend conventional radiofrequency denervation as the preferred definitive interventional treatment after successful diagnostic medial branch blockade [44].

Safety, Complications, Current Guidelines, and Future Perspectives

Both medial branch block (MBB) and conventional radiofrequency denervation (CRF) are considered safe minimally invasive procedures when performed by experienced clinicians under appropriate image guidance. The overall incidence of serious complications is low because both techniques target small sensory branches outside the spinal canal, thereby minimizing the risk of major neurological injury. Strict adherence to aseptic technique, careful patient selection, fluoroscopic guidance, and accurate needle placement are fundamental to reducing procedural risks and optimizing clinical outcomes [45].

Complications following MBB are generally mild and self-limiting. The most frequently reported adverse events include transient injection-site pain, localized bruising, vasovagal reactions, temporary numbness, and minor bleeding. Intravascular injection, allergic reactions to local anesthetics or contrast agents, and infection are uncommon but recognized complications that require appropriate preventive measures. Careful aspiration before injection, contrast confirmation of needle position, and adherence to sterile technique substantially reduce the likelihood of these events [46].

Similarly, CRF demonstrates an excellent safety profile, although procedure-specific complications may occur. Patients may experience temporary post-procedural discomfort, localized neuritis, transient dysesthesia, or muscle soreness during the early recovery period. Rare complications include thermal injury to adjacent neural structures, prolonged neuropathic pain, infection, or bleeding, particularly in patients receiving anticoagulant therapy. Appropriate sensory and motor stimulation before lesion creation, combined with correct electrode orientation and standardized lesion parameters, significantly minimizes these risks and contributes to consistent procedural success [47].

Current evidence-based clinical guidelines generally recommend a structured approach to managing suspected lumbar facet joint pain. Conservative treatment—including exercise therapy, pharmacological management, and rehabilitation—should precede interventional procedures whenever appropriate. Patients with persistent axial low back pain and a positive diagnostic medial branch block are considered suitable candidates for conventional radiofrequency denervation because of its superior durability of pain relief compared with repeated injection therapy. This sequential strategy improves diagnostic accuracy, enhances treatment effectiveness, and minimizes unnecessary procedures in patients without confirmed facet-mediated pain [48].

Several unresolved issues continue to influence clinical decision-making. Ongoing debate exists regarding the optimal threshold for defining a positive diagnostic block, the necessity of single versus dual confirmatory blocks, ideal radiofrequency lesion parameters, and the role of corticosteroids during therapeutic medial branch block. Advances in imaging technology, navigation systems, and modified radiofrequency techniques may further improve procedural accuracy and long-term outcomes. In addition, future studies emphasizing standardized methodologies, patient-reported outcomes, cost-effectiveness, and longer follow-up periods are needed to strengthen the existing evidence base [49].

In summary, current evidence indicates that both MBB and CRF play complementary roles in the management of chronic lumbar facet joint pain. Medial branch block remains indispensable for diagnosis and short-term symptom control, whereas conventional radiofrequency denervation offers more durable pain relief and functional improvement in appropriately selected patients. Continued refinement of patient selection criteria, procedural techniques, and evidence-based treatment algorithms is expected to further optimize outcomes and support individualized management strategies for patients with chronic lumbar facet-mediated low back pain [50].

Conclusion

Conventional medial branch radiofrequency denervation and medial branch block are both valuable interventions for chronic lumbar facet joint pain, but their roles are complementary rather than identical. Medial branch block remains essential for diagnosis and short-term therapeutic relief, while conventional radiofrequency denervation provides more durable pain control, better functional improvement, reduced analgesic requirement, and higher patient satisfaction in properly selected patients. Therefore, after confirmation of facet-mediated pain by diagnostic medial branch block, conventional radiofrequency denervation should be considered the preferred definitive interventional option, with attention to accurate technique, patient selection, and long-term follow-up.

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