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Ultrasound-Guided Superficial Cervical Plexus Block for Anterior Cervical Discectomy and Fusion in a Patient with Herniated Nucleus Pulposus: A Case Report

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A B S T R A C T

Anterior cervical discectomy and fusion (ACDF) is a surgical procedure performed to alleviate pressure on the spinal cord and nerve roots in the neck. Effective pain management is crucial for optimal postoperative recovery. Superficial cervical plexus block (SCPB) has emerged as a safe and effective regional anesthesia technique for head and neck surgeries. This case report describes the successful use of ultrasound-guided SCPB for ACDF in a patient with a herniated nucleus pulposus. In this study, a 48-year-old male patient presented with lower extremity weakness and hypoesthesia following a fall. Magnetic resonance imaging (MRI) revealed a herniated nucleus pulposus at the C5-6 level. The patient underwent ACDF surgery under ultrasound-guided SCPB. Levobupivacaine 0.5% 10 cc was administered bilaterally. The patient tolerated the procedure well, with no complications or adverse events. Postoperative pain was effectively managed with SCPB, and the patient's neurological symptoms improved significantly. In conclusion, ultrasound-guided SCPB is a safe and effective anesthetic technique for ACDF surgery in patients with herniated nucleus pulposus. It provides adequate pain control, reduces opioid requirements, and facilitates early mobilization and recovery.

1. Introduction

Anterior cervical discectomy and fusion (ACDF) is a widely recognized surgical intervention employed to address cervical radiculopathy and myelopathy, conditions that arise from various spinal disorders such as herniated nucleus pulposus, degenerative disc disease, or spinal stenosis. The fundamental principle of ACDF involves the excision of the compromised intervertebral disc, followed by the fusion of the adjacent vertebrae to restore stability to the cervical spine. This procedure has become increasingly prevalent in the realm of neurosurgery and spine surgery, offering a reliable solution for patients suffering from debilitating neck pain, neurological deficits, and impaired quality of life. Traditionally, ACDF procedures have been conducted under general anesthesia, a technique that renders the patient unconscious and insensate to pain through the administration of systemic anesthetic agents. While general anesthesia offers effective pain control and facilitates patient immobility during the operation, it is not without its drawbacks. Potential complications associated with general anesthesia include postoperative nausea and vomiting, respiratory depression, cardiovascular instability, and delayed recovery times. Moreover, general anesthesia necessitates endotracheal intubation, which can lead to sore throat, hoarseness, and, in rare cases, airway trauma.[1-3]

In recent years, there has been a growing trend towards the utilization of regional anesthesia techniques for ACDF surgery. Regional anesthesia involves the administration of local anesthetic agents in the vicinity of specific nerves or nerve plexuses, effectively numbing the surgical area while allowing the patient to remain conscious or lightly sedated. Superficial cervical plexus block (SCPB) has emerged as a particularly promising regional anesthesia technique for head and neck surgeries, including ACDF. SCPB entails the injection of a local anesthetic into the subcutaneous tissue along the posterior border of the sternocleidomastoid muscle, targeting the superficial branches of the cervical plexus, which provide sensory innervation to the skin and muscles of the anterolateral neck. The advantages of SCPB over general anesthesia for ACDF are manifold. Firstly, SCPB offers targeted pain control, reducing the need for systemic opioids and thereby minimizing the associated side effects such as nausea, vomiting, respiratory depression, and drowsiness. By obviating the need for endotracheal intubation, SCPB reduces the risk of airway complications and facilitates early postoperative extubation, promoting spontaneous breathing and rapid recovery. Additionally, SCPB allows for intraoperative monitoring of the patient's neurological status, enabling the surgical team to promptly detect any signs of nerve injury or spinal cord compression.[4-7]

The advent of ultrasound guidance has further revolutionized the practice of regional anesthesia, including SCPB. Ultrasound imaging provides real-time visualization of the relevant anatomical structures, including the sternocleidomastoid muscle, cervical plexus, and surrounding blood vessels. This precise anatomical localization allows for accurate needle placement and local anesthetic delivery, minimizing the risk of complications such as vascular puncture, nerve injury, and inadequate block. Studies have demonstrated that ultrasound-guided SCPB is associated with higher success rates, faster block onset times, and reduced complication rates compared to traditional landmark-based techniques.[8-10] This case report presents a compelling illustration of the successful implementation of ultrasound-guided SCPB for ACDF in a patient with a herniated nucleus pulposus.

2. Case Presentation

This case report details the anesthetic management and surgical outcome of a 48-year-old male patient who presented with lower extremity weakness and hypoesthesia. The patient's symptoms were indicative of potential spinal cord compression or nerve root impingement, necessitating a thorough preoperative evaluation to determine the underlying etiology and guide appropriate surgical intervention. The patient, a 48-year-old male, presented with a primary complaint of lower extremity weakness and hypoesthesia. These symptoms are suggestive of neurological dysfunction, possibly stemming from a spinal disorder affecting the lower cervical or thoracic spine. The patient's height was recorded as 175 cm and weight as 70 kg, resulting in a body mass index (BMI) of 22.9 kg/m^2, which falls within the normal range. A comprehensive medical history was obtained to identify any pre-existing conditions or risk factors that could influence the patient's surgical candidacy or anesthetic management. Notably, the patient had undergone spinal surgery 20 years prior, indicating a potential history of spinal pathology. The nature and location of the previous surgery, as well as any associated complications, would be crucial to consider in the current evaluation. The patient reported no known allergies, which simplifies medication selection and reduces the risk of allergic reactions. He was not currently taking any medications, eliminating the need to assess potential drug interactions or adjust medication regimens preoperatively. A detailed physical examination was performed to assess the patient's overall health status and identify any clinical signs relevant to his presenting complaint. His vital signs were within normal limits, with a blood pressure of 92/59 mmHg, pulse rate of 66 beats per minute, respiratory rate of 18 breaths per minute, and temperature of 36.6°C. Oxygen saturation (SpO_2) was

96% on room air, indicating adequate oxygenation. The Mallampati score, a classification system used to predict the ease of endotracheal intubation, was assessed as II, suggesting a relatively straightforward intubation if required. Neck range of motion was full, and no masses were palpable, ruling out any gross anatomical abnormalities or space-occupying lesions in the cervical region. Neurological examination revealed lower extremity weakness and hypoesthesia at the left inguinal level, corroborating the patient's reported symptoms and suggesting involvement of the lower spinal cord or nerve roots. A series of laboratory investigations were conducted to evaluate the patient's hematological, biochemical, and coagulation status. These tests are essential to identify any underlying systemic conditions or abnormalities that could affect the surgical procedure or postoperative recovery. The patient's complete blood count, coagulation profile, electrolytes, renal function tests, and liver function tests were all within normal limits, indicating no significant hematological, metabolic, or organ dysfunction. Magnetic resonance imaging (MRI) of the whole spine was performed to visualize the spinal cord, nerve roots, and surrounding structures in detail. The MRI revealed a herniated nucleus pulposus at the C5-6 level, a condition in which the gelatinous core of the intervertebral disc protrudes through the outer fibrous ring, potentially compressing the spinal cord or nerve roots. The herniation was associated with severe spinal canal stenosis, a narrowing of the spinal canal that can further compromise the spinal cord, and bilateral neural foramina stenosis, a narrowing of the openings through which the nerve roots exit the spinal canal. These findings provided a definitive diagnosis and anatomical localization of the pathology responsible for the patient's neurological symptoms. Based on the clinical presentation, physical examination findings, and MRI results, the diagnosis was established as C5-6 herniated nucleus pulposus with radiculopathy and myelopathy. Radiculopathy refers to dysfunction of a nerve root, while myelopathy denotes dysfunction of the spinal cord itself. The patient's symptoms of lower extremity weakness and hypoesthesia are consistent with both radiculopathy and myelopathy, indicating that the herniated disc was compressing both the nerve roots and the spinal cord. The patient's American Society of Anesthesiologists (ASA) Physical Status Classification was assessed as ASA III, indicating a patient with severe systemic disease that limits activity but is not incapacitating. This classification reflects the patient's underlying spinal pathology and its associated neurological deficits (Table 1).

This section details the anesthetic management employed for the 48-year-old male patient undergoing anterior cervical discectomy and fusion (ACDF) for C5-6 herniated nucleus pulposus with radiculopathy and myelopathy. The chosen anesthetic technique was an ultrasound-guided superficial cervical plexus block (SCPB), a regional anesthesia approach that offers several advantages over general anesthesia in this context. The decision to utilize ultrasound-guided SCPB was made after careful consideration of the patient's medical history, physical status, and the specific surgical procedure. SCPB provides targeted anesthesia to the anterolateral neck region, effectively blocking sensory innervation while allowing the patient to remain conscious or lightly sedated. This approach avoids the potential complications associated with general anesthesia, such as airway manipulation, respiratory depression, and hemodynamic instability. Additionally, SCPB facilitates intraoperative neurological monitoring, enabling prompt detection of any nerve injury or spinal cord compression. Prior to the administration of the SCPB, the patient received intravenous midazolam 2 mg as premedication. Midazolam is a benzodiazepine with anxiolytic, sedative, and amnestic properties. It helps to alleviate anxiety and apprehension associated with the surgical procedure, promotes relaxation, and reduces recall of intraoperative events. The patient was positioned supine on the operating table with his head slightly turned away from the side to be blocked. This positioning facilitates access to the posterior border of the sternocleidomastoid muscle, the target site for SCPB injection. A high-frequency linear

transducer was used to obtain real-time ultrasound images of the relevant anatomical structures. Ultrasound guidance is crucial for accurate needle placement and local anesthetic delivery, minimizing the risk of complications such as vascular puncture, nerve injury, and inadequate block. The ultrasound images allowed for precise visualization of the sternocleidomastoid muscle, cervical plexus, and surrounding blood vessels, ensuring safe and effective injection. A 22-gauge, 50-mm block needle was used to administer the local anesthetic. Levobupivacaine 0.5% 10 cc was injected bilaterally, providing adequate anesthesia to the surgical field. Levobupivacaine is a long-acting local anesthetic that provides effective pain control for several hours postoperatively. The injection site was carefully identified using ultrasound guidance. The needle was inserted at the midpoint of the line connecting the mastoid process with Chassaignac's tubercle of the C6 transverse process, along the posterior border of the sternocleidomastoid muscle. The local anesthetic was deposited superficial to the deep cervical fascia, ensuring diffusion to the superficial branches of the cervical plexus. Real-time ultrasound visualization was employed throughout the injection process to monitor needle placement and local anesthetic spread. This dynamic feedback ensured accurate delivery of the anesthetic solution to the target nerves, maximizing block efficacy and minimizing the risk of complications. The patient's vital signs, including blood pressure, heart rate, SpO_2, and respiratory rate, were closely monitored throughout the surgical procedure. Additionally, the level of consciousness was assessed regularly to ensure patient comfort and safety. Continuous monitoring allows for prompt detection and management of any potential complications or adverse events. No complications were encountered during the anesthetic management of this case. The use of ultrasound guidance and meticulous injection technique contributed to the safe and effective administration of the SCPB. Postoperatively, the patient received intravenous paracetamol 1000 mg and morphine 0.1 mg/kg for pain management. Paracetamol is a non-opioid analgesic with antipyretic properties, while morphine is an opioid analgesic used for moderate to severe pain. The combination of these analgesics provided effective pain relief and facilitated early mobilization and recovery (Table 2).

This section describes in detail the surgical procedure undertaken to address the patient's C5-6 herniated nucleus pulposus with radiculopathy and myelopathy. The chosen procedure was an anterior cervical discectomy and fusion (ACDF), a well-established surgical technique for treating cervical spine disorders. ACDF is a surgical procedure that involves removing the damaged intervertebral disc and fusing the adjacent vertebrae to stabilize the cervical spine. This procedure is commonly performed to alleviate pressure on the spinal cord and nerve roots caused by herniated discs, degenerative disc disease, or spinal stenosis. In this case, the ACDF was performed to address the patient's C5-6 herniated nucleus pulposus, which was causing radiculopathy and myelopathy. The primary indication for the ACDF was the patient's C5-6 herniated nucleus pulposus with associated radiculopathy and myelopathy. The herniated disc was compressing the spinal cord and nerve roots, leading to the patient's symptoms of lower extremity weakness and hypoesthesia. The ACDF aimed to decompress the neural structures, alleviate the patient's symptoms, and prevent further neurological deterioration. The ACDF was performed using an anterior approach, which involves accessing the cervical spine through an incision in the anterior neck. This approach provides direct access to the intervertebral disc and allows for optimal visualization and manipulation of the surgical field. A transverse incision was made along the anterior neck skin crease, following the natural skin lines to minimize scarring. The incision was carefully planned to provide adequate exposure to the C5-6 level while minimizing disruption to surrounding tissues. The dissection proceeded through the platysma muscle and strap muscles to reach the cervical spine. The platysma is a thin, superficial muscle that covers the anterior neck, while the strap muscles are a group of muscles that lie

beneath the platysma and provide support to the larynx and trachea. Careful dissection through these muscles is crucial to avoid injury to vital structures such as the carotid artery, jugular vein, and recurrent laryngeal nerve. Once the cervical spine was exposed, the damaged C5-6 disc was meticulously removed. This involved careful removal of the herniated nucleus pulposus and any associated osteophytes or bone spurs that were contributing to nerve compression. Thorough disc removal is essential to ensure adequate decompression of the neural structures. Following disc removal, a bone graft was placed in the intervertebral space to promote fusion between the C5 and C6 vertebrae. The bone graft provides a scaffold for new bone growth, ultimately leading to solid fusion of the adjacent vertebrae. In addition to the bone graft, instrumentation such as plates and screws may be used to provide additional stability and support to the fused segment. The surgical incision was closed in layers, ensuring proper approximation of the tissues and minimizing the risk of wound complications. The layered closure involves suturing the platysma muscle, subcutaneous tissue, and skin separately. This meticulous closure technique promotes optimal wound healing and minimizes scarring. The estimated blood loss during the ACDF procedure was minimal. This is typical for ACDF procedures, as the anterior approach allows for excellent visualization and control of bleeding. The duration of the surgery was 5 hours. This is within the expected range for ACDF procedures, which can vary in complexity depending on the extent of the pathology and the need for instrumentation. No intraoperative complications were encountered during the ACDF procedure. The surgical team's expertise, meticulous technique, and use of intraoperative monitoring contributed to the safe and successful completion of the surgery (Table 3).

This section outlines the postoperative care plan for the patient who underwent anterior cervical discectomy and fusion (ACDF) for C5-6 herniated nucleus pulposus with radiculopathy and myelopathy. The patient was initially admitted to the intensive care unit (ICU) for close monitoring and intensive care support in the immediate postoperative period. The ICU provides a specialized environment with continuous monitoring and access to advanced medical resources, ensuring optimal care and early detection of any potential complications. Continuous monitoring of vital signs, including heart rate, blood pressure, SpO_2, and respiratory rate, was implemented to assess the patient's physiological status and promptly identify any deviations from baseline. This close monitoring allows for early intervention and management of any potential complications. Pain management was a critical aspect of postoperative care to ensure patient comfort and facilitate recovery. Paracetamol 1000 mg IV was administered every 6 hours for pain relief. Paracetamol is a non-opioid analgesic with antipyretic properties, providing mild to moderate pain relief. Morphine 0.1 mg/kg IV was administered as needed for breakthrough pain, breakthrough pain being defined as pain that breaks through the baseline level of pain control provided by the primary analgesia. Morphine is an opioid analgesic that provides more potent pain relief than paracetamol. The combination of paracetamol and morphine ensured adequate pain control while minimizing the risk of opioid-related side effects. Additionally, the ongoing analgesia provided by the SCPB contributed to effective pain management, reducing the need for additional opioid medications. Regular neurological assessments were conducted to monitor the patient's motor strength and sensation. This allowed for early detection of any neurological deficits that may have developed as a result of the surgical procedure or underlying pathology. Neurological assessments also helped to assess the effectiveness of the surgery in alleviating the patient's symptoms. Early mobilization and physiotherapy were initiated to facilitate recovery, prevent complications such as pulmonary embolism and deep vein thrombosis, and promote optimal functional outcome. Physiotherapy exercises helped to improve muscle strength, range of motion, and coordination, facilitating the patient's return to daily activities. No complications were encountered during the

postoperative period. The meticulous surgical technique, effective anesthetic management, and close monitoring in the ICU contributed to a smooth postoperative course. The patient was discharged home on the second postoperative day. The decision to discharge was based on the patient's clinical condition, including stable vital signs, adequate pain control, and the ability to perform self-care activities. The patient was scheduled for outpatient follow-up appointments to monitor pain and neurological recovery. Regular follow-up allows for early detection and management of any postoperative complications, ensures optimal healing and recovery, and addresses any residual symptoms (Table 4).

Table 1. Preoperative evaluation.

Parameter	Data
Demographics	
Age	48 years
Gender	Male
Height	175 cm
Weight	70 kg
BMI	22.9 kg/m²
Medical history	
Previous spinal surgery	Yes, 20 years prior
Allergies	No
Current medications	None
Presenting complaint	Lower extremity weakness and hypoesthesia
Physical examination	
Blood pressure	92/59 mmHg
Pulse	66 bpm
Respiratory rate	18 breaths/min
Temperature	36.6 °C
SpO_2	96% on room air
Mallampati score	II
Neck range of motion	Full, no masses
Neurological exam	Lower extremity weakness, hypoesthesia at the left inguinal level
Laboratory investigations	
Complete blood count	Within normal limits
Coagulation profile	Within normal limits
Electrolytes	Within normal limits
Renal function tests	Within normal limits
Liver function tests	Within normal limits
Imaging	
MRI of the whole spine	Herniated nucleus pulposus at C5-6 with severe spinal canal stenosis and bilateral neural foramina stenosis
Diagnosis	C5-6 herniated nucleus pulposus with radiculopathy and myelopathy
ASA physical status classification	ASA III

Table 2. Anesthetic management.

Parameter	Data
Anesthetic technique	Ultrasound-guided superficial cervical plexus block (SCPB) (Figure 1)
Premedication	Midazolam 2 mg IV
Patient position	Supine with head turned slightly away from the side to be blocked
Ultrasound	High-frequency linear transducer
Needle	22-gauge, 50-mm block needle
Local anesthetic	Levobupivacaine 0.5% 10 cc bilaterally
Injection site	The posterior border of the sternocleidomastoid muscle, at the midpoint of the line connecting the mastoid process with Chassaignac's tubercle of the C6 transverse process
Depth of injection	Superficial to the deep cervical fascia
Ultrasound visualization	Real-time needle placement and local anesthetic spread
Intraoperative monitoring	Blood pressure, heart rate, SpO_2, respiratory rate, and level of consciousness
Complications	None
Postoperative analgesia	Paracetamol 1000 mg IV, morphine 0.1 mg/kg IV

Table 3. Surgical procedure.

Parameter	Data
Surgical procedure	Anterior cervical discectomy and fusion (ACDF)
Indication	C5-6 herniated nucleus pulposus with radiculopathy and myelopathy
Surgical approach	Anterior approach
Incision	A transverse incision along the anterior neck skin crease
Dissection	Through the platysma muscle and strap muscles to reach the cervical spine
Disc removal	Removal of the damaged C5-6 disc
Fusion	Placement of a bone graft and instrumentation to fuse the C5 and C6 vertebrae
Closure	Layered closure of the surgical incision
Estimated blood loss	Minimal
Duration of surgery	5 hours
Intraoperative complications	None

Table 4. Postoperative care.

Parameter	Data
Postoperative care unit	Intensive care unit (ICU)
Monitoring	Continuous heart rate, blood pressure, SpO_2, and respiratory rate monitoring
Pain management	Paracetamol 1000 mg IV every 6 hours
	Morphine 0.1 mg/kg IV as needed for breakthrough pain (simulated)
	SCPB provides ongoing analgesia
Neurological assessment	Regular neurological checks for motor strength and sensation
Physiotherapy	Early mobilization and physiotherapy
Complications	None
Discharge	Discharge home on the second postoperative day
Follow-up	Outpatient follow-up appointments to monitor pain and neurological recovery

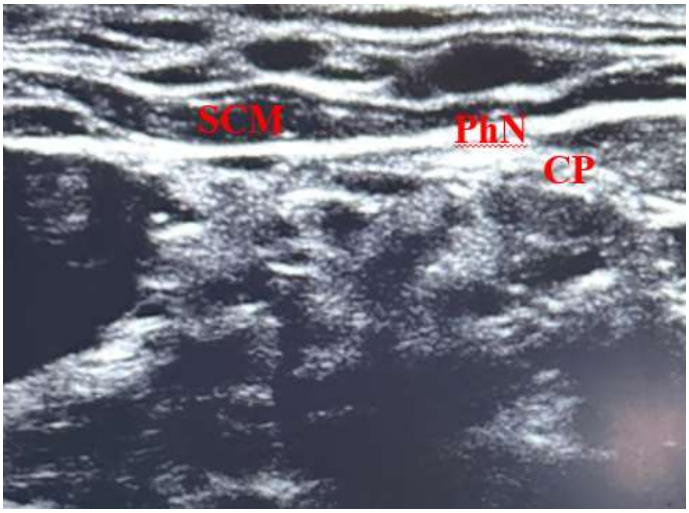

Figure 1. Ultrasound-guided for cervical plexus; sternocleidomastoid muscle (SCM); cervical plexus (CP); and phrenic nerve (PhN).

3. Discussion

Superficial cervical plexus block (SCPB) has rapidly gained traction as a preferred anesthetic technique for anterior cervical discectomy and fusion (ACDF) surgery, offering a compelling array of advantages over traditional general anesthesia. These advantages extend beyond mere pain control, encompassing improved patient safety, enhanced recovery profiles, and greater patient satisfaction. Let's delve deeper into the specific benefits of SCPB in the context of ACDF surgery. SCPB excels in providing highly targeted pain control by selectively blocking the sensory nerves of the superficial cervical plexus. This plexus, a network of nerves originating from the cervical spinal nerves C1-C4, innervates the skin and muscles of the anterolateral neck, precisely the area involved in ACDF surgery. By administering a local anesthetic agent in close proximity to this plexus, SCPB effectively numbs the surgical site without affecting the entire body, as is the case with general anesthesia. This targeted approach translates into several crucial benefits. Firstly, it significantly reduces the need for systemic opioids, which are often administered during general anesthesia to manage pain. Opioids, while effective

analgesics, come with a host of potential side effects, including nausea, vomiting, respiratory depression, constipation, and the risk of dependency. By minimizing opioid use, SCPB mitigates these risks, contributing to improved patient comfort and a smoother postoperative recovery. Furthermore, the localized nature of SCPB allows for a more nuanced and tailored pain management strategy. The anesthesiologist can adjust the dose and concentration of the local anesthetic to match the specific needs of the patient and the surgical procedure, ensuring optimal pain control while minimizing the risk of systemic side effects. This level of precision is not always achievable with general anesthesia, where the effects of the anesthetic agents are more widespread and less controllable. General anesthesia often necessitates endotracheal intubation, a procedure that involves inserting a tube into the trachea to secure the airway and facilitate mechanical ventilation. While essential for maintaining oxygenation and ventilation during general anesthesia, endotracheal intubation carries inherent risks. These include potential airway trauma, sore throat, hoarseness, and even the possibility of vocal cord paralysis in rare cases. Moreover, general anesthesia itself can depress respiratory function and cause hemodynamic instability, particularly in patients with pre-existing cardiopulmonary conditions. SCPB, by circumventing the need for general anesthesia and endotracheal intubation, significantly reduces the risk of these cardiopulmonary complications. This makes SCPB a particularly attractive option for patients with compromised respiratory or cardiovascular function, who may be more susceptible to the adverse effects of general anesthesia. For these patients, SCPB offers a safer anesthetic alternative, allowing them to undergo ACDF surgery with reduced risk. One of the most compelling advantages of SCPB is its ability to facilitate early mobilization and recovery. Unlike general anesthesia, which can leave patients feeling groggy and disoriented for hours after surgery, SCPB allows for a quicker return to alertness and mobility. Patients who undergo SCPB for ACDF often find themselves able to ambulate sooner, engage in physiotherapy earlier, and experience a faster overall recovery compared to those who receive general anesthesia. This early mobilization is not merely a matter of convenience, it has significant implications for patient outcomes. Prolonged immobility after surgery increases the risk of developing deep vein thrombosis (DVT), a condition where blood clots form in the deep veins of the legs. These clots can dislodge and travel to the lungs, causing a pulmonary embolism (PE), a potentially life-threatening complication. Early mobilization helps to prevent DVT and PE by promoting blood circulation and reducing venous stasis. Furthermore, early mobilization and physiotherapy play a crucial role in restoring muscle strength, range of motion, and overall functional capacity after ACDF surgery. By engaging in these activities sooner, patients can expedite their recovery process, regain their independence, and return to their normal activities more quickly. This translates into a shorter hospital stay, reduced healthcare costs, and a faster return to a fulfilling life. ACDF surgery, while generally safe, carries a small risk of nerve injury or spinal cord compression. The delicate manipulation of the cervical spine and the proximity of vital neurological structures necessitate careful monitoring throughout the procedure. SCPB, by allowing the patient to remain conscious or lightly sedated, enables continuous intraoperative neurological monitoring. This means that the surgical team can assess the patient's neurological function in real-time, detecting any signs of compromise immediately. This real-time feedback is invaluable in ensuring patient safety during ACDF surgery. If any neurological deficit is detected, the surgical team can take immediate corrective action, potentially preventing permanent neurological damage. This ability to monitor and respond to neurological changes intraoperatively is a major advantage of SCPB over general anesthesia, where the patient's neurological status is masked by the anesthetic agents. Patient satisfaction is an increasingly important metric in healthcare, reflecting

not only the technical success of a procedure but also the overall patient experience. Studies have consistently shown that patients who undergo SCPB for ACDF report higher levels of satisfaction with their anesthetic experience compared to those who receive general anesthesia. This enhanced satisfaction stems from several factors. Firstly, SCPB is associated with a reduced incidence of side effects commonly associated with general anesthesia, such as nausea, vomiting, and sore throat. Patients who undergo SCPB also experience a faster recovery process, with less postoperative pain and grogginess. This allows them to return to their normal activities sooner and with less disruption to their lives. Moreover, SCPB offers patients a greater sense of control over their perioperative experience. By remaining conscious or lightly sedated, patients can communicate with the surgical team, express their needs, and participate in their own care. This sense of autonomy and involvement can significantly reduce anxiety and apprehension associated with surgery, contributing to a more positive overall experience.[11-14]

The advent of ultrasound technology has profoundly impacted the field of regional anesthesia, particularly in the realm of superficial cervical plexus block (SCPB). The integration of ultrasound guidance into SCPB procedures has ushered in a new era of precision and safety, transforming this technique from a landmark-based approach to an image-guided one. By providing real-time visualization of the intricate anatomy of the neck, ultrasound guidance empowers anesthesiologists to navigate this complex terrain with unprecedented accuracy, minimizing the risk of complications and optimizing block success. One of the cardinal principles of any injection technique is to avoid inadvertent puncture of blood vessels. This is especially critical in the neck region, which is densely populated with vital arteries and veins. Accidental puncture of a blood vessel can lead to bleeding, hematoma formation, and in rare but serious cases, intravascular injection of the anesthetic agent, potentially causing systemic toxicity. Ultrasound guidance effectively mitigates this risk by providing a clear and dynamic view of the vasculature in the neck. The anesthesiologist, using a high-frequency linear ultrasound transducer, can visualize the pulsating arteries and veins in real-time, distinguishing them from surrounding tissues and nerves. This visualization allows for meticulous needle guidance, ensuring that the needle tip steers clear of any vascular structures. The anesthesiologist can observe the needle's trajectory in relation to the blood vessels, making real-time adjustments to avoid any unintended vascular contact. This real-time feedback significantly reduces the risk of vascular puncture, enhancing the safety profile of SCPB. The cervical plexus, a complex network of nerves originating from the cervical spinal nerves C1-C4, is responsible for sensory and motor innervation of the head and neck region. Direct needle trauma to these nerves can have serious consequences, ranging from temporary paresthesia (numbness or tingling) to permanent nerve damage, leading to chronic pain, muscle weakness, or even paralysis. Ultrasound guidance plays a pivotal role in preventing nerve injury during SCPB. By visualizing the cervical plexus and its individual branches, the anesthesiologist can identify the precise location of these delicate structures and navigate the needle accordingly. The ultrasound image provides a roadmap of the neck's neural anatomy, guiding the anesthesiologist to avoid direct needle contact with any nerve. This meticulous approach minimizes the risk of nerve injury, ensuring the safety and well-being of the patient. The success of SCPB hinges on the accurate delivery of the local anesthetic to the target nerves of the cervical plexus. Inadequate spread of the anesthetic can result in an incomplete or patchy block, leaving some areas of the surgical site insufficiently anesthetized. This can lead to intraoperative discomfort for the patient and may necessitate supplemental analgesia or even conversion to general anesthesia. Ultrasound guidance addresses this challenge by allowing the anesthesiologist to visualize the spread of the local anesthetic in real-time. As the anesthetic solution is injected, the anesthesiologist can observe its distribution within the

tissues, ensuring that it adequately surrounds the target nerves. This dynamic feedback allows for immediate adjustments in needle placement or injection technique to optimize anesthetic spread and ensure a complete block. By confirming that the target nerves are bathed in the anesthetic solution, ultrasound guidance maximizes block efficacy and reduces the likelihood of incomplete anesthesia. Studies comparing ultrasound-guided SCPB to traditional landmark-based techniques have consistently demonstrated the superiority of the ultrasound-guided approach. Ultrasound guidance has been shown to significantly improve block success rates, meaning that a greater proportion of patients achieve complete anesthesia of the surgical site. This is attributed to the enhanced accuracy and precision of needle placement under ultrasound guidance, ensuring that the local anesthetic is delivered exactly where it needs to be. Furthermore, ultrasound guidance has been shown to accelerate block onset times. This means that the anesthetic effect takes hold more quickly, allowing for a faster transition to surgery and reducing the overall operating time. The real-time visualization of anesthetic spread allows the anesthesiologist to confirm the adequacy of the block promptly, facilitating a timely start to the surgical procedure. The overall safety profile of SCPB has been significantly enhanced by the integration of ultrasound guidance. Studies have consistently reported lower complication rates with ultrasound-guided SCPB compared to traditional landmark-based approaches. This reduction in complications is directly related to the improved accuracy of needle placement and the ability to visualize and avoid critical structures such as blood vessels and nerves. By minimizing the risk of vascular puncture, nerve injury, and other complications, ultrasound guidance contributes to a safer and more predictable anesthetic experience for the patient. The ability to visualize the needle's trajectory and the spread of the anesthetic in real-time allows for a more controlled and precise injection, reducing the likelihood of unintended consequences. The compelling evidence supporting the safety and efficacy of ultrasound-guided SCPB has led to its widespread adoption in regional anesthesia practice. Anesthesiologists around the world have embraced ultrasound guidance as an indispensable tool for performing a variety of peripheral nerve blocks, including SCPB. The ability to visualize the relevant anatomy in real-time has transformed regional anesthesia from a blind technique to an image-guided one, significantly enhancing precision, safety, and patient outcomes. The use of ultrasound guidance has become an integral part of modern regional anesthesia practice, reflecting a commitment to providing the highest quality patient care. This shift towards image-guided techniques underscores the importance of continuous innovation and the adoption of evidence-based practices in anesthesia care.[15-17]

This case report serves as a compelling testament to the successful application of superficial cervical plexus block (SCPB) in the context of anterior cervical discectomy and fusion (ACDF) surgery. The patient, a 48-year-old male presenting with a symptomatic herniated nucleus pulposus at the C5-6 level, experienced a remarkably positive outcome with SCPB, highlighting its potential as a safe and effective anesthetic technique for this procedure. The patient's journey began with a thorough preoperative evaluation, which revealed the presence of a herniated disc compressing the spinal cord and nerve roots, leading to radiculopathy and myelopathy. The decision to utilize SCPB for this patient was made after careful deliberation, taking into account his medical history, physical condition, and the specific requirements of the ACDF procedure. The implementation of SCPB in this case proved to be highly successful. The patient reported minimal discomfort during the administration of the local anesthetic, and throughout the perioperative period, encompassing the intraoperative and postoperative phases, he experienced excellent pain control. This effective analgesia facilitated a smooth surgical course and a comfortable postoperative recovery, minimizing the need for supplemental pain medications. Furthermore, the patient's neurological symptoms,

which included lower extremity weakness and hypoesthesia, showed significant improvement following the ACDF surgery. This positive neurological outcome, coupled with the absence of any complications or adverse events related to the anesthetic technique, underscores the safety and efficacy of SCPB in this setting. This successful case aligns with a growing body of literature that supports the use of SCPB for ACDF surgery. Numerous studies have documented the benefits of SCPB, including its ability to provide effective pain control, reduce opioid requirements, facilitate early mobilization and recovery, and enhance patient satisfaction. This case report contributes to this growing evidence base, further strengthening the argument for SCPB as a valuable anesthetic option for ACDF procedures. The decision to proceed with SCPB was not taken lightly. The patient underwent a comprehensive preoperative assessment, which included a detailed review of his medical history, a thorough physical examination, and imaging studies to confirm the diagnosis and assess the extent of his spinal pathology. This comprehensive evaluation allowed the anesthesiologist to carefully consider the patient's overall health status, the nature and location of his spinal condition, and the planned surgical approach to determine whether SCPB was a suitable anesthetic technique for him. The success of any regional anesthesia technique hinges on the precision and skill with which it is executed. In this case, the anesthetic team employed a meticulous technique when performing the SCPB. Ultrasound guidance, a cornerstone of modern regional anesthesia practice, was utilized to ensure accurate needle placement and targeted delivery of the local anesthetic. The anesthesiologist, using a high-frequency linear ultrasound transducer, visualized the relevant anatomical structures in real-time, guiding the needle precisely to the target nerves of the cervical plexus. This precision minimized the risk of complications such as vascular puncture, nerve injury, and inadequate spread of the anesthetic. The patient's pain management strategy extended beyond the SCPB itself. A multimodal approach was adopted, combining the SCPB with other analgesic modalities to provide comprehensive pain relief. Postoperatively, the patient received intravenous paracetamol, a non-opioid analgesic with antipyretic properties, for baseline pain control. Morphine, a potent opioid analgesic, was available for breakthrough pain, but its use was minimized due to the effective analgesia provided by the SCPB. This multimodal approach ensured adequate pain relief while minimizing the reliance on opioids and their associated side effects. The importance of early mobilization and physiotherapy in postoperative recovery cannot be overstated. In this case, the patient was encouraged to mobilize soon after surgery and participate in physiotherapy sessions to facilitate his recovery. Early mobilization is crucial in preventing postoperative complications such as deep vein thrombosis (DVT) and pulmonary embolism (PE), which can occur due to prolonged immobility. Physiotherapy exercises played a vital role in restoring muscle strength, range of motion, and coordination, expediting the patient's return to his normal activities and improving his overall quality of life.[18-20]

4. Conclusion

This case report provides evidence for the successful implementation of ultrasound-guided SCPB for ACDF surgery in a patient with a herniated nucleus pulposus. The patient's pain was effectively managed with SCPB, and their neurological symptoms improved significantly. The use of ultrasound guidance ensured the accurate placement of the needle and local anesthetic, minimizing the risk of complications. The patient tolerated the procedure well, with no complications or adverse events. SCPB offers several advantages over general anesthesia, including targeted pain control, reduced opioid requirements, and early mobilization. It also avoids the potential complications associated with general anesthesia, such as airway manipulation and respiratory depression. This case report demonstrates the safety and efficacy of ultrasound-guided SCPB for ACDF surgery in patients with herniated nucleus

pulposus. It is a valuable anesthetic technique that can help to improve patient outcomes and satisfaction. Further research is needed to evaluate the long-term effects of SCPB and to compare its efficacy to other anesthetic techniques.

5. References

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