ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAY1186

Evaluation of the Efficacy of Fascia Iliaca Compartment Block in Maintaining Cognitive Function Post-Surgery in Elderly Individuals with Hip Fractures

Emery NIYONKURU[1]; Xu Zhang[2] and Peng Ma[1]
[1] Department of Anesthesiology, Affiliated Hospital of Jiangsu University, Zhenjiang City, Jiangsu Province, China
[2] School of Medicine, Jiangsu University, Zhenjiang City, Jiangsu Province, China

*Correspondence:
Peng Ma, Anesthesiologist, Department of Anesthesiology, Affiliated Hospital of Jiangsu University,
438 Jie Fang Road, Zhenjiang City, Jiangsu 212000, Jiangsu Province, China.

Abstract:- Postoperative cognitive dysfunction (POCD) is a prevalent issue among elderly hip fracture patients' post-surgery period, leading to cognitive decline and prolonged recovery. This narrative review delves into the efficacy of Fascia Iliaca Compartment Block (FICB) in addressing POCD. FICB, a targeted anesthetic approach, not only provides efficient pain management but also reduces inflammation and minimizes opioid reliance in the elderly. By alleviating pain and inflammation, FICB facilitates enhanced early postoperative mobility, potentially lowering the likelihood of cognitive dysfunction. Research indicates that FICB can decrease tau protein levels and inflammatory markers, attenuating the inflammatory cascade linked to cognitive impairment. Moreover, FICB's ability to offer localized pain relief without systemic opioid repercussions aids in preventing complications like delirium. The utilization of FICB emerges as a pivotal strategy in optimizing postoperative outcomes and diminishing POCD incidence in elderly hip fracture patients. Further exploration and integration of FICB in clinical practice hold promise for enhancing the care of this vulnerable patient cohort.

Keywords:- *Hip Fracture, Elderly Patients, Postoperative Cognitive Dysfunction, Fascia Iliaca Compartment Block, Inflammatory Markers.*

I. INTRODUCTION

Hip fractures in the elderly represent widespread injuries with high rates of morbidity and death. To improve outcomes and potentially lower mortality, perioperative enhancement, accelerated surgery, and early mobility are indispensable[1]. The incidence of postoperative cognitive decline (POCD) varies from seven percent to seventy-five percent despite successful major joint replacements. POCD is associated with cognitive impairment, mortality increases, and delayed mobility[2]. Orthopedics frequently encounter postoperative cognitive dysfunction (POCD), especially after total knee arthroplasty (TKA) and total hip replacement (THR). Higher mortality, morbidity, and medical expenses are associated with POCD in individuals with femur neck fractures. Earlier research has shown both modifiable and non-modifiable risk factors for POCD, which has influenced the development of preventative strategies[3]. POCD is a mental disorder affecting memory, concentration, and language comprehension. It increases morbidity and mortality in elderly surgical patients and hinders rehabilitation. Predisposing factors include surgery type, coexisting health problems, previous neurological disorders, and the elderly[4]. However, postoperative cognitive dysfunction (POCD) after hip fracture is often underrecognized and difficult to treat[5]. There are several risks linked with POCD, including mortality, premature employment exit, and dependency on social assistance. A cognitive dysfunction syndrome distinct from delirium or dementia, it is characterized by deficits in cognitive function[6]. Impaired cognitive status patients experience poorer postoperative outcomes after hip fracture, including decreased recovery, increased hospital stay, and increased mortality, affecting daily activities, functional abilities, and lifestyle[7]. According to the studies, the pain level of individuals with hip fractures and cognitive impairment is greater than that of subjects with healthy brain function, probably because these patients receive less pain medication and wait longer for pain treatment than their healthy counterparts.[7]. A study conducted by the National Hip Fracture Database revealed that 20 percent of UK patients struggled with early mobilization post-surgery because they were in pain or the hypotension was severe[8]. Postoperative inflammation is linked to pain conditions, with pro-inflammatory factors like CRP and IL-6 increasing post-operatively. These factors decrease after 3 days, and local analgesia can reduce cytokine release. Cognitively dysfunctional patients have higher postoperative CRP and IL-6 levels, according to a meta-analysis study[9]. Opioids were once the top pain medication, but now we know they aren't

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAY1186

always the best and can worsen pain. New methods using non-opioid combos may be more effective after surgery[10]. Various pain relief options are available for postoperative pain after hip replacement surgery, including opioids, loco-regional anesthesia, nerve blocks, nonsteroidal analgesics, and regional blocks. However, postoperative pain may be caused by several mechanisms, furthermore, their specific cause is unknown[11]. Additionally, it is extremely difficult to treat pain in elderly hip fracture patients because of intense mobilization discomfort and problems with standard analgesics' safety, which can lead to delirium in up to 70% of cases[1]. Furthermore, ineffective analgesia can lead to complications such as fear, anxiety, aggressive behavior, disturbance of cognition, and physiological changes, requiring personalized treatments[5]. Effective discomfort control is crucial for reestablishing early postoperative mobility in hip fracture patients to expedite recovery[8]. The purpose of this research was to examine how fascia iliaca compartment block (FICB) analgesia, could affect postoperative pain and postoperative cognitive dysfunction in elderly patients having hip fracture surgery.

II. METHODS

To conduct this narrative review, we searched on PubMed, Scopus and Google Scholar databases to locate clinical studies, meta-analyses, systemic reviews, and reviews that examined the impact of fascia iliaca compartment block on postoperative cognitive dysfunction in elderly patients with hip fractures from 2014 to 2023. Our search utilized keywords such as "hip fracture," "femoral neck fracture," "pain," "POCD," "analgesia, " "inflammatory markers," " TNF-α, IL-6, CRP, " and "NLRP3" in various combinations. A total of 9 studies were identified, all of which focused on impact of FICB on perioperative pain management, on inflammatory cytokines and POCD in hip fracture patients undergoing hip surgery.

III. RESULTS

The findings emphasize the substantial advantages of Fascia Iliaca Compartment Block (FICB) in pain management, inflammation reduction, and possibly preventing postoperative cognitive dysfunction (POCD) in elderly hip fracture patients. FICB appears effective not only in alleviating pain and reducing inflammation but also in enhancing postoperative recovery and potentially reducing the incidence of cognitive dysfunction in this vulnerable patient population.

- *Understanding POCD in Elderly Patients*

Elderly patients are more likely to experience nervous system problems after surgery, such as confusion, memory problems, stroke, and bleeding in the brain. These problems are becoming more common as more elderly people have surgery[12]. The exact cause of these problems is unknown, but some risk factors have been identified. These include age, genes, protein (Aβ), surgery type, and anesthesia all influence POCD risk. Other factors include surgery length, blood flow problems, and infections[12]. Intense pain is also a significant contributor to the development of delirium in hip fracture patients. Additionally, the use of opioids is another risk factor for this condition[13]. Health problems before surgery (pre-op) like heart issues, lung disease, diabetes, and high anesthesia risk score (ASA 3+) are also linked to POD[6]. Additionally, elderly patients with chronic pain before hip replacement surgery were more likely to experience POCD within a week of the surgery[2]. POCD in elderly hip surgery patients is a big problem. It weakens their response to complications and can lead to infections and blood clots. Studies show a high incidence, up to 72% after some surgeries. POCD also worsens recovery and puts a strain on families and society[14]. POCD poses a significant risk to undergone anesthesia patients and is a significant factor in both immediate and long-term poor outcomes[15]. Hip fracture surgery in the elderly can lead to POD and POCD, conditions associated with increased mortality, disease severity, and extended hospitalizations. The causes and pathophysiology of these complications are uncertain but inflammation and brain injury are thought to be key factors. Prevention is the best management strategy, with nonpharmacologic and pharmacologic interventions available for treatment. Early recognition and management are crucial for a positive prognosis[16]. It is commonly recognized that during POD and POCD, glial cell stimulation which results in inflammation and brain damage is mostly driven by inflammatory mediators. Growing data has shown that people at risk of POD or POCD have very high C-reactive protein levels and other inflammatory factors in their peripheral blood[16]. A few intraoperative strategies need to be taken into account, such as minimum anesthetic exposure under close observation. About the anesthetic option, Chen et al. discovered that inhalation anesthetics during heart surgery produced postoperative Mini-Mental State Exam (MMSE) scores that were greater than those obtained with whole intravenous anesthetics[17]. When considering sedative options for older people, propofol may be a more advantageous option than dexmedetomidine and midazolam, since the latter has the strongest inhibitory effects on cognitive processes. It has been proposed that postoperative care, such as the prompt detection and management of complications after surgery, may reduce the incidence of postoperative cognitive disorder (POCD)[17].

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAY1186

POCD differs from postoperative delirium (POD). Unlike POD's quick onset hours/days, POCD appears weeks or months later and lasts much longer some months or more. Both likely involve inflammation but POCD has additional contributing factors from surgery, anesthesia, and the patient's health[18]. Patients' quality of life is adversely affected by preoperative anxiety, depression, pain, and dysfunction. Pain sensitivity is altered by anxiety, i.e., elevated anxiety leads to increased pain sensitivity. Effective pain relief and restoration of functional mobility post-surgery are essential for alleviating negative emotions[19].

- *Prevention POCD*

Studies suggest Aβ protein buildup may predict cognitive decline and be a marker for increased risk of postoperative cognitive dysfunction (POCD). Measuring temperature, CO2 levels, tissue oxygenation, and Aβ levels could help predict POCD occurrence[12]**.** Another study suggests that measuring S100A12 levels after surgery may be a valuable tool for identifying patients at higher risk of POD and POCD. Elevated S100A12 appears to be linked to post-surgical inflammation and may serve as a potential biomarker for predicting these complications in elderly hip fracture patients[16]. The research examined whether MDA levels measured on the first day after surgery could predict cognitive decline in elderly patients who underwent hip fracture repair. The findings indicate that higher MDA levels on postoperative day 1 are associated with an increased risk of developing POCD in this population[15]. As pain increases the risk of postoperative cognitive issues (POCD), healthcare providers should prioritize this group. This could involve starting pain management before surgery and using the most effective anesthesia techniques available[2]. Pre-emptive analgesia with remifentanil via femoral nerve block reduces postoperative pain and POCD after TKA compared to post-surgery analgesia[20]. Regional analgesia reduces delirium risk in hip fracture patients, especially in those with moderate risk[13]. Additionally, local anesthesia, particularly peripheral and neuraxial nerve blocks, has been linked to a decreased likelihood of pulmonary complications, postoperative cognitive impairment, and shorter durations of intensive care unit stays[21]. An anesthetic technique using fascia iliaca block benefits elderly hip surgery patients by lowering pain, reducing opioid needs, and improving nerve block function. It also helps prevent cognitive decline and reduces inflammatory markers[22].

- *Analgesic Effects of FICB and its Role in Reducing POCD*

POCD is a frequent complication after surgery, especially in the elderly. It impairs cognitive function and has an unknown cause[1]. According to studies, senior citizens undergoing hip joint replacement surgery had an increased risk of developing POCD around 7 days after the procedure[2]. It was additionally found that neuronal microtubule-associated protein (tau) and β-Amyloid (Aβ) play significant roles in cognitive impairment. The use of general anesthesia has been demonstrated to significantly raise tau and Aβ protein concentrations in patients having hip arthroplasty, which could have delivered the early onset of POCD[23]. In elderly patients with high-risk hip replacements, FICB can significantly reduce pain and lower tau protein levels soon after surgery, thereby reducing the risk of cognitive impairment at the early stage of the recovery process[23]. According to Kailai Zhu et al.'s study, FICB can lessen pain after surgery and lower serum levels of TNF-α, IL-6, CRP, and NLRP3 in individuals with femoral intertrochanteric fractures without having any serious adverse effects[9]. After a traumatic injury, inflammatory cells mainly IL-6 migrate to the site of the injury, releasing cytokines, and causing local inflammation. The cytokines in the blood trigger a systemic reaction, increasing C-reacting proteins, serum amyloid A-protein, T- and B-cell activation, and inhibiting pro-inflammatory cytokines, leading to a compensatory anti-inflammatory response[11]. FICB provides better quality and shorter spinal anesthesia time for femur fracture patients than intravenous analgesics. Early postoperative pain in THA can be effectively relieved with FICB. Additionally, FICB can reduce adverse effects associated with opioid use and prolonged morphine administration[24].

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAY1186

Table 1. Evidence from the Studies of FICB on Postoperative Outcomes in Elderly Hip Fracture Patients

Study	Participants	Sample Size	Intervention	Outcomes	Key Findings
Randomized control trial [23]	Elderly (65-85 years old), ASA III-IV, hip arthroplasty	N=84, two groups	group of FICB followed by ropivacaine hypobaric plus spinal anesthesia	Pain, Hip function, Cognition, Blood biomarkers (β-amyloid, tau)	Group FICB had lower pain, better hip function, improved cognition (1- and 3-days post-surgery), lower β amyloid and tau (except tau at 3 days, p=0.05)
Retrospective data analysis [25]	Hip fracture patients (aged ≥ 65 years)	541 out of 959	Control: Standardized analgesic regimen. Experimental: Standardized analgesic regimen + administration FICB	Post-operative cognitive function measured by abbreviated mental test scores (AMTS)	Administration FICB was associated with higher odds of better post-operative cognitive function. Lower admission AMTS scores, and admission from residential/nursing homes are linked to worse cognitive outcomes
Randomized controlled trial [26]	Patients with femoral intertrochanteric fracture	n= 60	Inside approach FICB vs Outside approach FICB	*Primary outcomes: Ropivacaine dosage, VAS pain score, Use of patient-controlled analgesia (PCA), Cognitive score, Incidence of POCD, Serum levels of inflammatory markers (IL-1β, IL-6) * Secondary outcomes: Surgical indicators, Anesthesia cannula quality	Inside approach FICB showed benefits compared to outside approach: lower use of ropivacaine at 48 hours, shorter intubation time, higher depth of cannula placement, lower VAS score at 24 hours post-surgery, less use of PCA (pain medication) from 24-48 hours post-surgery, higher MMSE score (better cognitive function), lower incidence of POCD, lower serum levels of inflammatory markers (IL-1β, IL-6) at various time points

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAY1186

Single-blind randomized controlled trial[9]	Femoral intertrochanteric fracture	n=231 (FICB group: n=116, Control group: n=115)	FICB vs Control.	Pain: VAS score. Hip function: Harris score. Inflammatory factors: Serum levels of NLRP3, IL-6, TNF-α, CRP. Physiological parameters: Heart rate (HR), mean arterial pressure (MAP), SpO2. Complications: Postoperative complications	The FICB group had significantly lower HR and MAP after anesthesia induction compared to the control. VAS pain scores were significantly lower in the FICB group within 72 hours post-surgery compared to control. The FICB group had also significantly lower serum levels of NLRP3, IL-6, TNF-α, and CRP at various time points compared to the control. A positive correlation was observed between NLRP3/IL-6 and CRP/VAS scores at 1 hour after surgery. No significant differences in Harris hip score or postoperative complications between groups
Retrospective cohort study [27]	Patients with hip, femoral neck, or peri trochanteric femur fracture in elderly over 65 years old	n=220 FICB group: 110, no block group: 110	*FICB group: Preoperative FICB with continuous infusion *No-FICB group: No block	*Length of hospital stay * Pain scores (post-operative days 2 and 3) * Time from admission to surgery * Narcotic use * Discharge 30-day readmission rate * Medical complications * Mortality	FICB group had a significantly shorter length of stay (3.9 vs 4.8 days). FICB group had lower pain scores on post-operative days 2 and 3. No significant differences in time to surgery, narcotic use, or medical complications between groups. FICB group was more likely to be discharged to a skilled nursing facility and experience 30-day readmission.
Single-center, randomized, prospective trial [28]	Unilateral total hip arthroplasty ≥65 years	n =60, each group: 30	CFICB group: Continuous fascia iliaca	Quality of Recovery score (QoR-15), Pain	CFICB group had significantly higher QoR-15 score at 24

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAY1186

			compartment block (CFICB) vs PCIA group: Patient-controlled intravenous analgesia	score (at rest and during movement), Number of patients requiring additional pain medication, Time to first walking after surgery, Incidence of postoperative complications, Bromage score (level of sedation), Length of hospital stay	hours post-surgery compared to PCIA group. Pain scores were lower in the CFICB group at all measured time points (12, 24, 48 hours). No significant differences in time to walking, complication rates (except dizziness), or length of stay between groups. More patients in the CFICB group reported mild sedation (Bromage score 1) at 24 hours.
Prospective, observational cohort study[29]	Patients aged 55–90 with traumatic hip fractures were admitted to five trauma centers	n=517 FICB (381) vs. no FICB (136)	FICB vs. no FICB	Primary endpoint: Delirium development (Confusion Assessment Method tool) from admission through 48 hours postoperatively. Secondary endpoints: Preoperative and postoperative opioid requirements, pain numeric rating scale scores	Delirium incidence: 5.4%, similar for FICB (5.8%) and no FICB (4.4%). Opioid requirements were comparable between groups. Lower pain scores with FICB preoperatively (4.2 vs. 5.1) and postoperatively (2.9 vs. 3.5). FICB demonstrated significant benefit on self-reported pain without reducing opioid consumption. Similar delirium incidence suggests the need for a randomized trial to assess the effect of FICB on delirium.
RCT [30]	Elderly patients undergoing total hip arthroplasty	n=119	Control: General anesthesia only; FICB: FICB after surgery; Combined: DEX before + FICB after surgery	VAS score, PCIA use, serum levels of IL-1β, IL-6, CRP, PSQI score	Combined group had lower pain scores, lower PCIA use, lower inflammatory factors, and better sleep quality compared to other groups. FICB group had lower pain scores than control group.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAY1186

Double-Blind Randomized Controlled Trial[31]	Hip fracture patients	n=127	FICB + regular analgesia vs. regular analgesia alone	Cognitive status before FICB and on day 1 post-surgery	No significant change in cognitive status after FICB. FICB did not affect cognitive status in hip fracture patients in this study

IV. DISCUSSION

POCD is a disorder of the central nervous system most frequently occurring in elderly patients. In addition to disorientation, anxiety, memory loss, and impaired brain function, this condition is characterized by cerebral dysfunction. Elderly patients often have pre-existing conditions such as hypertension, diabetes, COPD, and cardiovascular disease including valve disorders, syndromes of arrhythmia, and inadequate heart function, which may contribute to the development of POCD[23]. The American Society of Anesthesiologists has identified several risk factors that contribute to peri-/post-operative complications for hip fracture, including age, general anesthesia, delayed surgical treatment, enteral steroids, frailty, and male gender[32]. Anesthesia type, evaluation methods for POCD, and diagnostic criteria may all play a role in POCD development. Other possible risk factors include preoperative mental function, surgery duration, lack of oxygen, embolism, pain after surgery, complications related to the respiratory system, and infectious diseases. Moreover, multivariate logistic regression analysis suggests that higher basal body temperature is significantly associated with POCD[12]. POCD can also be caused by the stress of surgery, pain after surgery, the type of anesthesia, and inflammation that results from surgery[33]. A patient suffering from POCD is distinguished by difficulty with memory, learning, and maintaining concentration for some time after surgery. The severity of POCD influences early retirement, poor quality of life, and premature death. The incidence of POCD among adult subjects within three months of surgery is about 6%, while the incidence among seniors is approximately 13%[34]. The term POCD is used to describe cognitive disorders that occur after surgery and anesthesia. It was coined in the late 1990s. There are a variety of mild and severe perioperative cognitive disorders, including delirium and dementia, identified in Miller's latest issue[35]. Hyperactivity of the hypothalamic-pituitary-adrenal (HPA) axis and higher cortisol levels are linked to delirium and POCD in aged patients. Delirium involves changes in consciousness and attention, while POCD refers to declines in cognitive performance compared to a patient's baseline[5]. POCD has several characteristics, including the inability to remember, cognitive abilities, and cognitive control. These syndromes are associated with extended hospitalization, healthcare complications, and a prolonged recovery period[6]. Besides enhancing the production of prostaglandin from arachidonic acid and permeabilizing the barrier between the blood and the brain, cyclooxygenase-2(COX-2) has been described as a crucial neuroinflammation mediator and, consequently, a vital target for POCD medications. Parecoxib can potentially treat earliest POCD within a single week, and reduce quantities of S100 calcium-binding protein B protein (S100β) and interleukin-6 (IL-6) within two days following surgery, according to a meta-analysis. Possible therapies for POCD can include other anti-inflammatory drugs like dexamethasone and minocycline[17]. One frequent orthopedic procedure to treat hip discomfort caused by chronic diseases is total hip arthroplasty (THA). Four hundred thousand THA procedures are done in the United States each year. After one of these procedures, patients frequently endure excruciating pain, prolonged hospital stays, difficulty walking, dissatisfaction, and raised opioid use for pain management. These side effects can include delirium, urinary issues, respiratory arrest, and cognitive decline[36]. PNB combined with IV PCA seemed to lessen postoperative pain and complications in seniors who had Bipolar hip arthroplasty due to femur neck fractures, including delirium and pneumonia[37].

Elderly patients face significant challenges, including increased risk of perioperative and postoperative complications, neurocognitive disorders, extended hospital stays, social dependency, poorer quality of daily life, and a higher risk of death[38]. A study by Kragsbjerg et al. indicates that serum CRP rises shortly after surgery, increases 48-96 hours later, and then declines a little over three weeks later. Proinflammatory cytokines such as IL-1, TNFα, and IL-6 are generated more when inflammation occurs, along with fibrinogen, another acute-phase reactant[39]. According to the study, there is a strong correlation between acute postoperative discomfort and delirium since it stimulates pro-inflammatory mediators to be released more quickly, which in turn accelerates the development of delirium. By preventing the release of cytokines that trigger inflammation, FICB's anticipatory analgesic effect can help avoid perioperative delirium. Furthermore, cutting back on opiate use can also lessen the production of cytokines that promote inflammation[40]. POCD is impaired memory and intellectual function caused by anesthesia and surgery. It is characterized by lower scores on neuropsychological tests after surgery[3]. Extended periods of rehabilitation are linked to inadequate pain management. Pain after surgery becomes a major issue following hip procedures and delayed healing raises the risk of surgical complications. To better manage pain and lessen

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAY1186

consequences like POCD, nerve blocks have been performed more frequently in recent years[41]. Additionally, patients at high risk having Mini-Cog scores of two points or below can benefit from perioperative cFNB to avoid POCD. Research has also shown a strong correlation between a type of surgery and age at the onset of POCD[3]. In the United States, total joint replacement is expected to be used to treat 572,000 hip fractures by 2030, and 6.26 million procedures will be carried out by 2050. Despite THA's extensive use, controlling discomfort following femur fractures still presents certain therapeutic difficulties[30]. Additionally, inflammatory cytokines including CRP and IL-6 heightened after hip surgery, especially in seniors, but their levels start to diminish three days post-surgery. However, it was recently found that local infiltration analgesia may lower the creation of cytokines[42]. Hip fractures cause twenty percent of patients to die within a year, eighty-five percent of patients needing to be sent to a post-acute rehabilitation facility, and fifty percent of patients losing their independence permanently. These factors place a heavy load on the healthcare system. Almost all traumatized hip fractures require surgery. Typically, intravenous opioids are used to manage pain before surgery. However, are related to negative effects in elderly patients[29]. According to previous study results, FICB has an efficacy rate of 90% when used for analgesia perioperatively in elderly people with hip fractures. Furthermore, it lessens surgical stress responses. Due to the FICB's proactive analgesic impact, perioperative delirium can be prevented by inhibiting the formation of inflammatory cytokines. The release of inflammatory cytokines can also be controlled by trimming opiate use[43]. The study evaluated thirty-day complications afterward surgery in elderly patients undergoing hip replacement under spinal anesthesia versus general anesthesia. Results showed general anesthesia patients had higher complication and mortality rates than SA[44]. Desai et al. found that regional anesthesia techniques, specifically peripheral nerve blocks, result in a reduction in the overall cause of mortality and readmission rate of older patients with hip fractures[45]. There is a higher risk of complications and death in elderly individuals due to multiple illnesses, multiple medications, weakness, osteosarcopenia, nutritional deficiency, motionlessness, cognitive disorders, and other chronic diseases. Traumatology clinics have arisen to provide better treatment for older patients, treating them in tandem with geriatricians and trauma surgeons[46]. However, the incidence of POCD after elective THA/TKA is 19.5 percent for early POCD and about 10 percent for late POCD. It is possible to correlate cognitive reserve with POCD and preoperative cognitive decline. Comparison of neurocognitive test scores before and after surgery helps determine the diagnosis[6]. It is proven that after surgery that does not involve the heart, the rate of POCD can range from 7 to 26 percent, whereas within six days of joint replacement, it can reach 72 percent, and six months later it can still reach thirty percent[14]. POCD is associated with a weaker response in the face of adverse circumstances, a greater likelihood of developing complications such as pneumonia, deep vein thrombosis, and hemorrhoids, and impacts recovery indirectly after hip replacement surgery. POCD can negatively impact patient outcomes and postoperative mortality, with longer durations affecting long-term recovery effects as confirmed by numerous clinical studies and animal experiments[14]. Surgery-induced inflammation response is typically temporary and resolves on its own in most patients, but those with POCD experience enhanced inflammation. In some studies, nonsteroidal anti-inflammatory substances have been found to inhibit inflammation and enhance cognition. Surprisingly, dexamethasone, an anti-inflammatory drug, did not lower the risk of POCD. Additionally, POCD patients have elevated cortisol levels after surgery[47]. However, it has been found that dexamethasone modulates Th17/Treg imbalance, possibly attenuating inflammatory response and damage to the blood-brain barrier (BBB) in elderly orthopedic patients with POCD[48].

It recently demonstrated that surgical trauma-related peripheral inflammation and the subsequent release of systemic inflammatory markers impact central nervous system inflammatory mechanisms by activating neurogliocytes and leading to simultaneously endogenous production of pro-inflammatory cytokines[49]. Acute inflammation phase response, neutrophil leukocytosis, lymphocyte development, and production of cytokines are indicators of immunological and hematological abnormalities. The production of cytokines from stimulated leukocytes, fibroblasts, and endothelial cells—primarily interleukin-1 (IL-1), tumor necrosis factor-α (TNF-α), and IL-6—plays a significant role in the development of a systemic inflammatory response. According to several authors, inflammation is a major factor in the pathophysiology of POCD[50]. After major joint arthroplasty, the occurrence of POCD ranges from sixteen percent to forty-five percent, with higher rates seen at six days and six months following surgery (72 percent and 30 percent, respectively). Thromboembolic consequences, the impact of anesthetic, and the role of pain medication in the postoperative phase are just a few of the many theories put forth. In addition to lengthy bone fractures and extensive immobility, perioperative anxiousness, and surgical techniques might contribute to the high rate of cognitive impairment in orthopedic patients[50]. A hip fracture patient's postoperative cognitive decline and delirium are largely caused by inadequately treated discomfort and insufficient analgesia, which increases the risk of extended hospitalizations and increased mortality. Many illnesses can cause cognitive impairment, such as persistent dementia and severe delirium. For patients suffering from fractures of the hip, FICB provides opioid-sparing analgesia, which lessens pain and lowers the probability of delirium and cognitive decline after surgery[25]. Anesthetic's impact on cognitive performance is contingent upon the specific drugs' therapeutic effects and pharmacokinetics. After surgery, there may be a decline in cognitive function due to an inflammatory response of the central nervous system (CNS) exacerbated by

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAY1186

anesthesia and surgery. Furthermore, exposure to anesthesia and surgery increases IL-6 concentration in the brain, causing neuronal apoptosis and heightened release of TNF-α. S-100β protein may indicate brain-brain barrier damage[51]. POCD is a disorder that mainly recurs in the first four days following surgery and is associated with old age, heart disease, hormonal illness, previous exposure to surgery, and changes in the nervous system. Nonetheless, pain could result in adverse effects on cognitive function and even cause it to decline. POCD can be reduced by using appropriate analgesics, good pain assessment, and avoiding the progression of acute discomfort into persistent pain[23]. The nerve block technique has the benefit of not simply assisting with efficient control of pain both before and after operations, but also assisting in maintaining hemodynamic equilibrium, lowering the risk of POCD, and avoiding the negative effects of general anesthesia on the cardiac and pulmonary systems[52]. While FICB considerably reduced pain ratings, Kristin Salottolo et al.'s extensive prospective cohort research concluded that FICB did not provide analgesic efficacy superior to systematic pain medication for delirium, opiate drug usage, or analgesic-related problems[29]. However, instead of using traditional analgesics following arthroplasty, MUHAMMAD et al. found that the use of anesthetic FICB was highly effective in reducing discomfort and generating fewer side effects. Also, regarding those who got FICB, the overall satisfaction rate was more extensive[53][21][54]. Furthermore, while treating THA patients, the inside FICB technique had a decreased risk of POCD, greater anesthetic efficacy, improved afterward analgesia, significantly fewer preoperative analgesics usage, and decreased serum cytokines when opposed to the conventional technique[26]. The data that currently exists in observational research of medium-to-high quality indicates that there is a correlation between POD and POCD and the levels of inflammation indicators found in CSF and peripheral blood. Certain indicators, such as CRP and IL-6, are exclusive to either POCD or POD, whereas others are involved in both conditions[18]. POCD post-THA is a real condition that shouldn't be ignored, according to Chunmei Fu et al.'s meta-analysis. It does exhibit some obvious inflammatory symptoms. Patients with POCD who have THA have significantly higher levels of CRP and S-100B before surgery, as well as CRP and IL-6 six hours after surgery[55]. In addition to reducing perioperative discomfort, improving surgical healing, and reducing the length of hospitalization, multimodal pain management can also temporarily ease postoperative stress and feelings of hopelessness[19]. Dong et al. discovered that, compared to the posterior lumbar plexus block, the anterior iliopsoas space block offered more effective perioperative analgesia during hip surgery. Additionally, it delivers safe and efficient analgesia for hip fractures that necessitate internal fixation or joint replacement, such as femoral neck and trochanter fractures[56]. PNB techniques including FICB are advantageous for THA patients because they offer enough analgesic effects after surgery, particularly during the first postoperative period of resting discomfort without weakening the quadriceps[36]. The findings from RCT of Gordana Kristek and al point towards a potential link between postoperative pain, inflammation, and cognitive decline in elderly patients. Levobupivacaine, with its anti-inflammatory properties, might be a better choice for pain control due to its ability to reduce both pain and inflammation, ultimately protecting against cognitive decline[39]. Additionally, the study suggests that continuous FNB may be beneficial for pain management and reducing the risk of POCD, particularly for high-risk patients undergoing femoral neck fracture surgery[3][22]. The fascia iliaca compartment block (FICB) has been widely shown to successfully reduce postoperative pain in patients undergoing hip surgery like total hip arthroplasty. Studies demonstrate FICB significantly reduces pain, decreases opioid consumption, shortens rehabilitation time, and improves cognitive function, with a more favorable safety profile compared to other regional blocks[57].

V. CONCLUSION

FICB offers a promising approach to mitigating POCD in elderly hip fracture patients through effective pain management, inflammation reduction, and minimized opioid use, ultimately improving recovery outcomes.

- *Authors' Contributions*

The study design was conceptualized by all authors. The initial draft of this review was collectively written by all authors. All authors participated in revising the manuscript. Before submission to the journal, the final manuscript has been reviewed and approved by all authors.

- *Competing Interests*

The authors declare no competing interests in the article

REFERENCES

[1]. D. J. Houserman *et al.*, 'The Impact of the Fascia Iliaca Block Beyond Perioperative Pain Control in Hip Fractures: A Retrospective Review', *Geriatr. Orthop. Surg. Rehabil.*, vol. 13, pp. 1–8, 2022, doi: 10.1177/21514593221099107.

[2]. X. Huai *et al.*, 'Preoperative Chronic Pain as a Risk Factor for Early Postoperative Cognitive Dysfunction in Elderly Patients Undergoing Hip Joint Replacement Surgery: A Prospective Observational Cohort Study', *Front. Neurosci.*, vol. 15, no. December, 2021, doi: 10.3389/fnins.2021.747362.

[3]. Y. Wu and R. Han, 'Perioperative continuous femoral nerve block reduces postoperative cognitive dysfunction of high-risk patients with femoral neck fracture: Evidence from a retrospective propensity-matched study', *Med. Sci. Monit.*, vol. 26, pp. 1–10, 2020, doi: 10.12659/MSM.919708.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAY1186

[4]. P. Tzimas, E. Samara, A. Petrou, A. Korompilias, A. Chalkias, and G. Papadopoulos, 'The influence of anesthetic techniques on postoperative cognitive function in elderly patients undergoing hip fracture surgery: General vs spinal anesthesia', *Injury*, vol. 49, no. 12, pp. 2221–2226, 2018, doi: 10.1016/j.injury.2018.09.023.

[5]. L. Sakic, D. Tonkovicc, Z. Hrgovic, and A. Klasan, 'Spinal Dexamethasone Effect on Cognitive Disorders After Hip Surgery', *Med. Arch.*, vol. 77, no. 1, pp. 18–23, 2023, doi: 10.5455/medarh.2023.77.18-23.

[6]. P. Kitsis *et al.*, 'Postoperative Delirium and Postoperative Cognitive Dysfunction in Patients with Elective Hip or Knee Arthroplasty: A Narrative Review of the Literature', *Life*, vol. 12, no. 2, 2022, doi: 10.3390/life12020314.

[7]. X. Y. Li, L. Zhang, Y. M. Ding, C. X. Wang, and Y. Qiu, 'Effects of fascia iliaca compartment block as an adjunctive management to parecoxib for pain control after total hip arthroplasty', *Med. (United States)*, vol. 101, no. 30, p. E29688, 2022, doi: 10.1097/MD.0000000000029688.

[8]. L. Nuthep, S. Klanarong, and S. Tangwiwat, 'The Analgesic effect of adding ultrasound-guided pericapsular nerve group block to suprainguinal fascia iliaca compartment block for hip fracture surgery: A prospective randomized controlled trial', *Medicine (Baltimore).*, vol. 102, no. 44, p. e35649, 2023, doi: 10.1097/MD.0000000000035649.

[9]. K. Zhu, F. Zheng, C. Wang, and L. Ding, 'Effect of Ultrasound-Guided Fascia Iliac Compartment Block on Serum NLRP3 and Inflammatory Factors in Patients with Femoral Intertrochanteric Fracture', vol. 2022, 2022.

[10]. T. J. Adams, D. M. Aljohani, and P. Forget, 'Perioperative opioids: a narrative review contextualising new avenues to improve prescribing', *Br. J. Anaesth.*, vol. 130, no. 6, pp. 709–718, 2023, doi: 10.1016/j.bja.2023.02.037.

[11]. J. Kuchálik, A. Magnuson, E. Tina, and A. Gupta, 'Does local infiltration analgesia reduce peri-operative inflammation following total hip arthroplasty? A randomized, double-blind study', *BMC Anesthesiol.*, vol. 17, no. 1, pp. 1–9, 2017, doi: 10.1186/s12871-017-0354-y.

[12]. X. ming Li, M. tao Shao, J. juan Wang, and Y. lan Wang, 'Relationship between post-operative cognitive dysfunction and regional cerebral oxygen saturation and β-amyloid protein', *J. Zhejiang Univ. Sci. B*, vol. 15, no. 10, pp. 870–878, 2014, doi: 10.1631/jzus.B1400130.

[13]. A. Simić *et al.*, 'Peripheral Nerve Blocks for Hip Fractures in Emergency Medicine', *Acta Clin. Croat.*, vol. 61, pp. 78–83, 2022, doi: 10.20471/acc.2022.61.s1.13.

[14]. G. Li and J. Jia, 'Convolutional neural network to explore the effect of the drug on postoperative POCD in elderly patients with hip fracture', *J. Intell. Fuzzy Syst.*, vol. 39, no. 4, pp. 4989–4997, 2020, doi: 10.3233/JIFS-179984.

[15]. C. Wu, B. Gao, and Y. Gui, 'Malondialdehyde on postoperative day 1 predicts postoperative cognitive dysfunction in elderly patients after hip fracture surgery', *Biosci. Rep.*, vol. 39, no. 6, pp. 1–9, 2019, doi: 10.1042/BSR20190166.

[16]. Q. H. Li *et al.*, 'Relation of postoperative serum S100A12 levels to delirium and cognitive dysfunction occurring after hip fracture surgery in elderly patients', *Brain Behav.*, vol. 9, no. 1, pp. 1–9, 2019, doi: 10.1002/brb3.1176.

[17]. B. Liu *et al.*, 'Recent advances and perspectives of postoperative neurological disorders in the elderly surgical patients', *CNS Neurosci. Ther.*, vol. 28, no. 4, pp. 470–483, 2022, doi: 10.1111/cns.13763.

[18]. X. Liu, Y. Yu, and S. Zhu, 'Erratum: Inflammatory markers in postoperative delirium (POD) and cognitive dysfunction (POCD): A meta-analysis of observational studies (PLoS ONE (2018) 13: 4 (e0195659) DOI: 10.1371/journal.pone.0195659)', *PLoS One*, vol. 13, no. 12, pp. 1–22, 2018, doi: 10.1371/journal.pone.0209284.

[19]. C. Zheng, Z. Hou, T. Wang, L. Yi, and Y. Chen, 'Impact of multimodal analgesia on postoperative anxiety and depression following total knee arthroplasty', *J. Orthop. Surg. Res.*, vol. 18, no. 1, pp. 1–8, 2023, doi: 10.1186/s13018-023-04192-8.

[20]. L. Q. Deng *et al.*, 'Effect of pre-emptive analgesia by continuous femoral nerve block on early postoperative cognitive function following total knee arthroplasty in elderly patients', *Exp. Ther. Med.*, vol. 13, no. 4, pp. 1592–1597, 2017, doi: 10.3892/etm.2017.4099.

[21]. J. Bangshoej, T. Thougaard, H. Fjeldsøe-Nielsen, and S. Viggers, 'Preoperative Pain Management of Patients with Hip Fractures: Blind Fascia Iliaca Compartment Block Compared to Ultrasound Guided Femoral Nerve Block—A Randomized Controlled Trial', *Open J. Anesthesiol.*, vol. 10, no. 11, pp. 371–380, 2020, doi: 10.4236/ojanes.2020.1011033.

[22]. J. Zha, J. Ni, S. Chen, H. Feng, T. Che, and S. Qiao, 'Ultrasound Radiomics-Guided Iliac Fascia Block on Postoperative Cognitive Dysfunction in Elderly Patients Undergoing Hip Surgery', *Comput. Math. Methods Med.*, vol. 2022, 2022, doi: 10.1155/2022/2492667.

[23]. L. Tang *et al.*, 'Fascia iliaca compartment block can reduce the incidence of early post-operative cognitive impairment in elderly patients with high-risk hip replacement', *Front. Aging Neurosci.*, vol. 14, 2022, doi: 10.3389/fnagi.2022.1025545.

[24]. Y. Gao, H. Tan, R. Sun, and J. Zhu, 'Fascia iliaca compartment block reduces pain and opioid consumption after total hip arthroplasty: A systematic review and meta-analysis', *Int. J. Surg.*, vol. 65, no. February, pp. 70–79, 2019, doi: 10.1016/j.ijsu.2019.03.014.

[25]. P. M. Odor, I. Chis Ster, I. Wilkinson, and F. Sage, 'Effect of admission fascia iliaca compartment blocks on post-operative abbreviated mental test scores in elderly

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAY1186

fractured neck of femur patients: A retrospective cohort study', *BMC Anesthesiol.*, vol. 17, no. 1, pp. 1–8, 2017, doi: 10.1186/s12871-016-0297-8.

[26]. T. Feng, J. Zhao, J. Wang, X. Sun, T. Jia, and F. Li, 'Anesthetic Effect of the Fascia Iliaca Compartment Block with Different Approaches on Total Hip Arthroplasty and Its Effect on Postoperative Cognitive Dysfunction and Inflammation', *Front. Surg.*, vol. 9, no. May, 2022, doi: 10.3389/fsurg.2022.898243.

[27]. D. J. Houserman *et al.*, 'The Impact of the Fascia Iliaca Block Beyond Perioperative Pain Control in Hip Fractures : A Retrospective Review', vol. 13, pp. 1–8, 2022, doi: 10.1177/21514593221099107.

[28]. Y. Gao, H. Li, H. Hu, Y. Xu, J. Zhou, and Y. Liu, 'Effects of Continuous Fascia Iliaca Compartment Block on Early Quality of Recovery After Total Hip Arthroplasty in Elderly Patients: A Randomized Controlled Trial', *J. Pain Res.*, vol. 15, pp. 1837–1844, 2022, doi: 10.2147/JPR.S368285.

[29]. K. Salottolo *et al.*, 'A multi-institutional prospective observational study to evaluate fascia iliaca compartment block (FICB) for preventing delirium in adults with hip fracture', *Trauma Surg. Acute Care Open*, vol. 7, no. 1, pp. 1–7, 2022, doi: 10.1136/tsaco-2022-000904.

[30]. X. Liu, X. Hu, R. Li, and Y. Zhang, 'Combination of post-fascia iliaca compartment block and dexmedetomidine in pain and inflammation control after total hip arthroplasty for elder patients: A randomized control study', *J. Orthop. Surg. Res.*, vol. 15, no. 1, pp. 1–6, 2020, doi: 10.1186/s13018-020-1562-6.

[31]. P. Wennberg, M. Möller, J. Herlitz, and E. Kenne Sarenmalm, 'Fascia iliaca compartment block as a preoperative analgesic in elderly patients with hip fractures - Effects on cognition', *BMC Geriatr.*, vol. 19, no. 1, pp. 1–8, 2019, doi: 10.1186/s12877-019-1266-0.

[32]. T. Knauf *et al.*, 'Medical and economic consequences of perioperative complications in older hip fracture patients', pp. 7–12, 2020.

[33]. S. S. Arora, J. L. Gooch, and P. S. García, 'Postoperative cognitive dysfunction, Alzheimer's disease, and anesthesia', *Int. J. Neurosci.*, vol. 124, no. 4, pp. 236–242, 2014, doi: 10.3109/00207454.2013.833919.

[34]. Y. Zhang *et al.*, 'The Effect of Dexmedetomidine on Cognitive Function and Protein Expression of A β, p-Tau, and PSD95 after Extracorporeal Circulation Operation in Aged Rats', *Biomed Res. Int.*, vol. 2018, 2018, doi: 10.1155/2018/4014021.

[35]. R. Ehsani, S. D. Motlagh, B. Zaman, S. S. Kashani, and M. R. Ghodraty, 'Effect of general versus spinal anesthesia on postoperative delirium and early cognitive dysfunction in elderly patients', *Anesthesiol. Pain Med.*, vol. 10, no. 4, pp. 1–8, 2020, doi: 10.5812/aapm.101815.

[36]. H. J. Park, K. K. Park, J. Y. Park, B. Lee, Y. S. Choi, and H. M. Kwon, 'Peripheral Nerve Block for Pain Management after Total Hip Arthroplasty: A Retrospective Study with Propensity Score Matching', *J. Clin. Med.*, vol. 11, no. 18, 2022, doi: 10.3390/jcm11185456.

[37]. T. S. Lee, J. Y. Park, M. C. Park, and K. K. Park, 'Evaluating pain management and complications from peripheral nerve block and intravenous patient-controlled analgesia for geriatric patients following bipolar hemiarthroplasty for displaced femoral-neck fracture', 2023.

[38]. L. Morisson *et al.*, 'Effect of electroencephalography-guided anesthesia on neurocognitive disorders in elderly patients undergoing major non-cardiac surgery: A trial protocol the POEGEA trial (POncd Elderly GEneral Anesthesia)', *PLoS One*, vol. 16, no. 8 August, pp. 1–16, 2021, doi: 10.1371/journal.pone.0255852.

[39]. G. Kristek *et al.*, 'Influence of postoperative analgesia on systemic inflammatory response and postoperative cognitive dysfunction after femoral fractures surgery: A randomized controlled trial', *Reg. Anesth. Pain Med.*, vol. 44, no. 1, pp. 59–68, 2019, doi: 10.1136/rapm-2018-000023.

[40]. C. Hao *et al.*, 'Effects of Perioperative Fascia Iliaca Compartment Block on Postoperative Pain and Hip Function in Elderly Patients With Hip Fracture', vol. 13, pp. 1–8, 2022, doi: 10.1177/21514593221092883.

[41]. M. Azizoğlu and Ş. Rumeli, 'Comparison of the suprainguinal fascia iliaca compartment block with continuous epidural analgesia in patients undergoing hip surgeries: a retrospective study', *Brazilian J. Anesthesiol. (English Ed.*, vol. 72, no. 3, pp. 342–349, 2022, doi: 10.1016/j.bjane.2021.07.006.

[42]. K. Zhu, F. Zheng, C. Wang, and L. Ding, 'Effect of Ultrasound-Guided Fascia Iliac Compartment Block on Serum NLRP3 and Inflammatory Factors in Patients with Femoral Intertrochanteric Fracture', *Comput. Math. Methods Med.*, vol. 2022, 2022, doi: 10.1155/2022/1944659.

[43]. C. Hao *et al.*, 'Effects of Perioperative Fascia Iliaca Compartment Block on Postoperative Pain and Hip Function in Elderly Patients With Hip Fracture', *Geriatr. Orthop. Surg. Rehabil.*, vol. 13, pp. 1–8, 2022, doi: 10.1177/21514593221092883.

[44]. A. R. Chowdary, J. Beale, J. Martinez, V. Aggarwal, V. Mounasamy, and S. Sambandam, 'Postoperative complications of spinal vs general anesthesia in elderly patients undergoing hip hemiarthroplasty', *Arch. Orthop. Trauma Surg.*, no. 0123456789, 2023, doi: 10.1007/s00402-023-04876-0.

[45]. L. Zhan, Y. J. Zhang, and J. X. Wang, 'Combined fascia iliaca compartment block and monitored anesthesia care for geriatric patients with hip fracture: Two case reports', *World J. Clin. Cases*, vol. 9, no. 27, pp. 8268–8273, 2021, doi: 10.12998/wjcc.v9.i27.8268.

[46]. T. Kappenschneider *et al.*, 'Special orthopaedic geriatrics (SOG) - a new multiprofessional care model for elderly patients in elective orthopaedic surgery: a study protocol for a prospective randomized controlled trial of a

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAY1186

multimodal intervention in frail patients with hip and knee', *BMC Musculoskelet. Disord.*, vol. 23, no. 1, pp. 1–13, 2022, doi: 10.1186/s12891-022-05955-w.

[47]. L. W. Wang *et al.*, 'FKBP51 is associated with early postoperative cognitive dysfunction in elderly patients undergoing hip fracture surgery', *Med. (United States)*, vol. 98, no. 5, pp. 1–6, 2019, doi: 10.1097/MD.0000000000014037.

[48]. W. Zhao, H. Zhang, and J. Li, 'Effect of dexmedetomidine on postoperative cognitive dysfunction in elderly patients undergoing orthopaedic surgery: study protocol for a randomized controlled trial', *Trials*, vol. 24, no. 1, pp. 2634–2644, 2023, doi: 10.1186/s13063-023-07110-9.

[49]. Y. Zhu *et al.*, 'Enhanced neuroinflammation mediated by DNA methylation of the glucocorticoid receptor triggers cognitive dysfunction after sevoflurane anesthesia in adult rats subjected to maternal separation during the neonatal period', *J. Neuroinflammation*, vol. 14, no. 1, pp. 1–16, 2017, doi: 10.1186/s12974-016-0782-5.

[50]. D. Tomaszewski, 'Biomarkers of Brain Damage and Postoperative Cognitive Disorders in Orthopedic Patients: An Update', *Biomed Res. Int.*, vol. 2015, no. 1, 2015, doi: 10.1155/2015/402959.

[51]. A. Sahoo *et al.*, 'Effect of anesthetic agents on cognitive function and peripheral inflammatory biomarkers in young patients undergoing surgery for spine disorders', *Asian J. Neurosurg.*, vol. 14, no. 04, pp. 1095–1105, 2019, doi: 10.4103/ajns.ajns_173_19.

[52]. J. Aliste *et al.*, 'Randomized comparison between pericapsular nerve group (PENG) block and suprainguinal fascia iliaca block for total hip arthroplasty', *Reg. Anesth. Pain Med.*, vol. 46, no. 10, pp. 874–878, 2021, doi: 10.1136/rapm-2021-102997.

[53]. M. Habib Khan, S. Hussain, M. Gulzar Khan, J. Bahadar, M. Kashif, and R. Uddin, 'Efficacy of Ultrasound Guided Fascia Iliaca Block for Pain Management Compared to Conventional Pain Killers; A Comparative Study', *Pakistan J. Med. Heal. Sci.*, vol. 15, no. 8, pp. 2525–2528, 2021, doi: 10.53350/pjmhs211582525.

[54]. H. K. Hong and Y. Ma, 'The efficacy of fascia iliaca compartment block for pain control after hip fracture: A meta-Analysis', *Med. (United States)*, vol. 98, no. 28, pp. 1–11, 2019, doi: 10.1097/MD.0000000000016157.

[55]. C. Fu, J. Lin, G. Gong, W. Zhong, H. Chen, and X. Luo, 'Inflammatory markers in postoperative cognitive dysfunction for patients undergoing total hip arthroplasty: a meta-analysis', *Aging Clin. Exp. Res.*, vol. 34, no. 2, pp. 277–288, 2022, doi: 10.1007/s40520-021-01919-7.

[56]. J. Dong *et al.*, 'Ultrasound-guided anterior iliopsoas muscle space block versus posterior lumbar plexus block in hip surgery in the elderly: A randomised controlled trial', *Eur. J. Anaesthesiol.*, vol. 38, no. 4, pp. 366–373, 2021, doi: 10.1097/EJA.0000000000001452.

[57]. P. Kukreja, L. Mason, J. Feinstein, S. E. Morris, and H. Kalagara, 'Regional Anesthesia for Total Hip Arthroplasty: Essential Anatomy, Techniques, and Current Literature Review', *Curr. Anesthesiol. Rep.*, vol. 11, no. 4, pp. 457–466, 2021, doi: 10.1007/s40140-021-00487-w.