ISSN: 2690-9189

Research Article

International Journal of Orthopaedics Research

Pain Assessment in Elderly Patients Undergoing Total Knee Arthroplasty: Integration of The Sane Scale

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Submitted: 2025, Jan 28; **Accepted:** 2025, Mar 03; **Published:** 2025, Mar 11

Citation: Borghi, P. H., Souza, J. P. B. D., Veneri, L. M., Pinheiro, B. F., Magalhães, V. D. A., et al. (2025). Pain Assessment in Elderly Patients Undergoing Total Knee Arthroplasty: Integration of The Sane Scale. *Int J Ortho Res, 8*(1), 01-06.

Abstract

Objective: *This study evaluates the effectiveness of surgical intervention on pain levels and functionality in patients with knee osteoarthritis. Using validated instruments—the Visual Analog Scale (VAS), McGill Pain Questionnaire, and Single Assessment Numeric Evaluation (SANE)the study assessed changes over three time points: preoperative, 24 hours postoperative, and 30 days postoperative.*

Methods: *Data were collected and analyzed using statistical methods, demonstrating significant reductions in pain and improvements in functional perception. Multidisciplinary approaches were also considered.*

Results: *Pain levels decreased progressively, with significant improvements in functionality. The findings align with prior studies highlighting the role of surgical and multidisciplinary interventions.*

Conclusion: *Surgical intervention effectively reduces pain and enhances functionality, improving quality of life in patients with knee osteoarthritis.*

Keywords: Knee Osteoarthritis, Pain Management, Functional Recovery, Surgical Intervention, Quality of Life.

1. Introduction

Knee osteoarthritis is a progressive degenerative joint condition frequently associated with aging. This condition is characterized by chronic pain, joint stiffness, and severe functional limitation. It is one of the leading causes of disability in elderly individuals, significantly impacting mobility, independence, and consequently, quality of life [1].

In cases where conservative treatment proves insufficient, Total Knee Arthroplasty (TKA) emerges as the main therapeutic intervention. This approach is widely recognized for its effectiveness in reducing pain and improving joint functionality [2].

The pain associated with knee osteoarthritis transcends the physical domain, also affecting emotional and psychosocial dimensions [3]. This multifactorial condition negatively influences overall functionality and perceived well-being, imposing a significant burden on the individual.

Recent studies have highlighted that, in addition to pain relief, the success of surgical interventions such as TKA is measured by their ability to comprehensively restore functional performance and quality of life [4,5]. This underscores the need for systematic and multidimensional assessments of these outcomes.

Pain assessment presents inherent challenges due to its subjective

nature. This subjectivity reflects not only the intensity of the symptom but also the individual's perception of its associated functional and emotional impact [3,6].

In this context, the use of complementary tools that capture these multiple dimensions in an integrated manner becomes essential. The Single Assessment Numeric Evaluation (SANE) stands out as a practical, patient-centered tool. It allows a global assessment that considers both clinical aspects and the individual's subjective perception of their functional condition [7,8]. Its applicability in clinical and research settings has proven valuable, especially when combined with other standardized instruments, such as the Visual Analog Scale (VAS) and the McGill Pain Questionnaire [9,10].

Given the relevance of the topic, this study aimed to investigate the perception of pain in elderly individuals undergoing TKA. The study sought to analyze the implications of this pain on overall functionality and quality of life. The use of validated instruments, such as the VAS, the McGill Pain Questionnaire, and the SANE, provided a robust methodological approach capable of integrating the physical, emotional, and functional dimensions of pain.

2. Methodology

2.1. Participant Characteristics

This study included 20 elderly individuals, comprising 16 women and 4 men, with a mean age of 71.59 ± 3.14 years. All participants were clinically diagnosed with unilateral knee osteoarthritis and reported chronic pain that restricted their performance in daily living activities. Additional demographic and anthropometric characteristics of the participants are detailed in Table 1.

Group	Age (years)	Height (cm)	Body Mass (kg)	Gender
G1	71.59 (±3.14)	162 (±16.21)	80.63 (±2.07)	Male: 4 Female: 16
Legend: Demographic and anthropometric characteristics of the study participants. Values are presented as means and standard deviations for age, height, and body mass, categorized by gender.				

Table 1: Participant Characteristics

2.2. Ethical Aspects

This study was conducted with the approval of the Ethics Committee for Research of the Federal University of Goiás (CEP/UFG), under protocol number 24845019.20000.5083. Adults and elderly individuals voluntarily participated by signing the Informed Consent Form (ICF), authorizing their participation in the research. It is noteworthy that all participants had the right to withdraw at any stage of the study, ensuring their autonomy and decision-making capacity.

Furthermore, the study adhered strictly to the General Data Protection Law (LGPD - Law No. 13,709/2018), ensuring the security and confidentiality of the information provided. All procedures followed the relevant ethical and legal principles regarding the privacy and data protection of participants.

2.3. Assessment Instruments

The instruments used in this study were selected based on their relevance and scientific validation for evaluating specific aspects of pain and patients' perceptions of their health condition. The Visual Analog Scale (VAS) was employed to measure pain intensity, using a numerical scale from 0 to 10, where 0 indicates "no pain" and 10 represents "the worst pain imaginable." This instrument is widely validated in the literature and recognized for its simplicity and effectiveness in assessing subjective pain [11].

The McGill Pain Questionnaire was applied to investigate different dimensions of pain, including sensory, affective, and evaluative components. This instrument consists of pain descriptors organized into categories, allowing a detailed analysis of the pain experience. Developed by Melzack (1975), the questionnaire is widely used in research and clinical practice to better understand the multidimensional aspects of pain [9].

Finally, the Single Assessment Numeric Evaluation (SANE) was utilized to assess the patient's overall perception of their health condition on a scale from 0 to 100. This instrument, recommended by Williams et al. (2012), offers a simple and effective approach to capturing the patient's self-assessment and is particularly useful for measuring the global impact of a specific condition on quality of life [12].

2.4. Procedures

The evaluations were conducted at three distinct time points: the preoperative period, 24 hours after surgery, and 30 days following the surgical procedure. During each assessment phase, participants completed the selected instruments under the supervision of trained professionals, ensuring the standardization and reliability of the collected data. To minimize postoperative pain, an anesthetic block was performed in accordance with established clinical guidelines.

2.5. Statistical Analysis

The data collected were processed and analyzed using Minitab 21 software. The student's t-test was applied to compare the means across the different assessment time points, with the significance level set at $p \leq 0.05$. The results are presented as mean ± standard deviation, ensuring a clear and standardized description of the data.

3. Results

The analysis of the Visual Analog Scale (VAS) results revealed

a significant reduction in pain levels over the three assessment time points. Before surgery, patients reported a mean score of 9.76 ± 8.99, indicating high pain intensity. Twenty-four hours after surgery, a reduction in pain was observed, with the mean decreasing to 8.4 ± 5.87, although still at high levels. Thirty days after surgery, the reduction was even more pronounced, with the mean pain score reaching 6.16 ± 1.29. These results demonstrate the effectiveness of the surgical procedure in progressively alleviating pain over time, with statistically significant differences ($p < 0.001$).

Group	Before Surgery	24 Hours Post-Surgery	30 Days Post-Surgery	p-value
G1	9.76 (±8.99)	8.4 (±5.87)	6.16 (±1.29)	< 0.001

Table 2: Visual Analog Scale (VAS) Pain Analysis

The results of the McGill Pain Questionnaire indicated a significant improvement in both the quantitative and qualitative aspects of pain. The Number of Words Chosen (NWC), which reflects the intensity and diversity of reported pain, decreased from 12.6 ± 3.9 in the preoperative period to 2.71 ± 0.9 after 30 days ($p < 0.001$). Similarly, the Affective Pain Rating Index (PRI-A), which evaluates the emotional impact of pain, showed a significant reduction. In the preoperative period, the mean score was 10.0 ± 9.9, indicating a high emotional impact. After 24 hours, this score decreased to 7.21 ± 4.5, and at the 30-day mark, it reached 0.00 ± 0.0, indicating no emotional impact associated with pain ($p = 0.001$).

Measure	Before Surgery	24 Hours Post-Surgery	30 Days Post-Surgery	p-value
Number of Words Chosen (NWC)	12.6 (±3.9)	11.7 (±6.9)	2.71 (±0.9)	< 0.001
Affective Pain Index (PRI-A)	10.0 (±9.9)	7.21 (±4.5)	0.00 (±0.0)	0.001

Table 3: McGill Pain Questionnaire

The analysis of the SANE Scale revealed a significant improvement in patients' functional perception over time. In the preoperative period, the mean score was 35.0, indicating substantial functional limitations. Thirty days after the surgical procedure, the mean score increased significantly to 75.0 ($p < 0.001$), reflecting a considerable improvement in functionality. The SANE results demonstrate that the procedure not only reduced pain but also positively impacted patients' overall perception of their functionality and quality of life.

Group	Before Surgery	30 Days Post-Surgery	p-value
G1	35.0	75.0	< 0.001

Table 4: SANE Scale

4. Discussion

The Visual Analog Scale (VAS) showed a significant reduction in pain levels across three time points: preoperative, 24 hours post-surgery, and 30 days post-surgery. These results align with the findings of Delgado et al. (2018), who validated the VAS as a reliable tool for pain measurement in various clinical contexts [11]. The reduction in pain levels is also consistent with literature highlighting the efficacy of anesthetic blocks for managing postoperative pain [13,14]. The application of the block in this study likely contributed to the observed reduction in pain within the first 24 hours.

The progressive reduction over 30 days reflects functional recovery and adaptation to the surgical procedure. Studies such as Messier et al. (2021) suggest that high-impact interventions, including strength training and surgical procedures, contribute to improved function and reduced pain in patients with knee osteoarthritis [15].

The McGill Pain Questionnaire demonstrated significant reductions in both the Number of Words Chosen (NWC) and the Affective Pain Index (PRI-A). These findings confirm the relevance of the instrument in assessing not only pain intensity but also its multidimensional aspects, as emphasized by Melzack (1975) [9]. The reduction in PRI-A is particularly significant, as it reflects a decreased emotional impact of pain, suggesting an improved quality of life for the patients. This aligns with Ferreira (2001) and Oliveira et al. (2023), who highlighted the importance of addressing emotional aspects of chronic pain [3,16].

The positive impact of surgery can also be explained by the multidisciplinary management of chronic pain, which includes physical therapy and rehabilitation. Mendonça et al. (2023) highlighted that such approaches contribute to patients' overall perception of improvement after 30 days [17].

The results from the SANE Scale indicated significant progress in the functional perception of patients. Preoperatively, the mean score was 35.0, which increased to 75.0 after 30 days. This

improvement aligns with the findings of Wintersitein et al. (2013) and Austin et al. (2019), who validated the SANE as a reliable tool for postoperative functional evaluation. Studies like Torchia et al. (2020) also demonstrate that the SANE is comparable to multi-item measures in terms of sensitivity and specificity, reinforcing its utility in this study [4,5,18].

The functional progression can also be attributed to pain reduction, as suggested by Seeley et al. (2021), who emphasized the relationship between knee pain and movement neuromechanics. Improved functional perception is a key indicator of success in interventions like total knee arthroplasty [19].

The observed reduction in pain and functional improvement aligns with prior studies investigating the relationship between chronic pain, function, and quality of life. Dulay et al. (2015) highlighted that knee pain is a major factor limiting mobility and functional capacity in individuals with osteoarthritis [20]. This study reinforces those conclusions by demonstrating that appropriate interventions can mitigate such negative impacts.

Additionally, the multidisciplinary approach to chronic pain management is crucial for therapeutic success. Studies by Raja et al. (2020) and Kanematsu et al. (2022) emphasized the importance of personalized interventions that address both the physical and emotional aspects of pain [6,21].

The results also highlight the intrinsic relationship between chronic pain and quality of life, a topic widely discussed in literature. Aguiar et al. (2021) and Oliveira et al. (2023) describe how chronic pain significantly compromises quality of life and daily living activities [19,22]. In this study, the functional improvement reported through the SANE Scale supports the hypothesis that pain reduction directly contributes to the recovery of autonomy and overall well-being.

In terms of clinical implications, the findings of this study reinforce the necessity of both surgical and non-surgical interventions for managing pain and function in patients with osteoarthritis. Future studies could explore differences in multidisciplinary interventions and their long-term effects on pain recurrence rates.

The results demonstrate that surgery is effective in reducing pain and improving function in patients with knee osteoarthritis, as evidenced by the VAS, McGill Pain Questionnaire, and SANE Scale. These findings align with the literature and emphasize the importance of multidisciplinary approaches for chronic pain treatment. Additional studies may help refine management strategies and optimize outcomes for different patient populations.

5. Conclusion

This study highlights the effectiveness of surgical intervention in managing pain and improving functionality in patients with knee osteoarthritis. The reduction in pain levels, as measured by the Visual Analog Scale and McGill Pain Questionnaire, underscores the significance of targeting both sensory and affective dimensions of pain. Moreover, the functional progress observed through the SANE Scale reflects the broader impact of the intervention on quality of life.

The findings emphasize the necessity of combining surgical procedures with multidisciplinary pain management strategies to achieve optimal outcomes. These results contribute to the growing body of evidence supporting the efficacy of surgical interventions for chronic pain and functionality improvement. Future research should aim to explore long-term effects and compare outcomes across different patient profiles and treatment modalities [23-43].

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