Relationship Between Duration of Surgery and Post-operative Quality of Life in Cases of Neurological Tumors; A Retrospective Study.

Ali Mohammed Radhi [@] , Firas Faleh Mehdi Alhamdani [#]

@ FIBMS/Neurosurgery – Department of Surgery – Al-Zahraa College of Medicine – University of Basrah - Barsrah – Iraq. ali.radhi@uobasrah.edu.iq
 # FIBMS/Neurosurgery – Department of Surgery – Basrah College of Medicine – University of Basrah - Barsrah – Iraq. firas.mahdi@uobasrah.edu.iq

Abstract

Duration of surgery is an important factor in the postoperative recovery of patients undergoing neurologic tumor removal. This study examines the relationship between the duration of surgery and postoperative quality of life in patients with neurological tumors.

By retrospectively analyzing data from 450 patients, this study aims to determine how delayed surgical time affects postoperative complications, recovery time, and quality of life. The resulting coefficients show that longer operative time is associated with increased postoperative complications, slower healing time and decreased quality of life. Figures Scatter plot showing the relationship between operative time and postoperative period complications.

In summary, understanding these complications can help in surgery planning mapping that well help surgeons to try to overcome these post-operative complications related to longer duration of surgery.

Keywords:
Neurological tumor, duration of surgery, postoperative complications, functional recovery, quality of life.

1. Introduction

Neurological tumors often pose significant challenges in surgical oncology due to complex areas and the risk of affecting vital neurological functions **(de Loubresse, 2014; Fujibuchi et al., 2017)**. Factors such as the size, location, and complexity of these tumors develop over time and it is used to greatly influence the operation **(Broggi et al., 2023; Heimans and Reijneveld, 2012).** While a longer operative time may be necessary for a successful tumor resection, it also carries other risks, such as increased blood loss, increased chance of infection, patient recovery time **(Park et al., 2023)**. Understanding the length and effect of prolonged operative time on quality of life after surgery is important for optimize outcomes **(Peltrini et al., 2019)**. It can guide both surgical planning and patient counseling.

This study examines the relationship between duration of surgery and measures of postoperative quality of life, including functional capacity, incidence of complications, and quality of life as patients self-reported potential by investigating these underlying associations, we aim to provide insights that may help balance the need for maximal tumor removal and time-reducing strategies length of surgery to improve patient-centered outcomes.

Background

An extensive study of various surgical procedures shows that prolonged operative time is associated with an increased risk of postoperative complications and decreased patient quality of life **(Cheng et al., 2017)**. In the context of surgical oncology, prolonged operating room stay is associated with increased adverse outcomes such as infection and late recurrence, either of which can reduce both patient well-being and quality of life so size is associated **(Dencker et al., 2021;**

Duchman et al., 2017). Prolonged techniques in neurosurgery have demonstrated associations with cognitive impairment, physical limitations, and decreased postoperative independence, posing significant challenges to patients' long-term functioning and independence **(Cheng et al., 2018)**. **Philips et al., (2012)** documented that the postsurgical complications in long duration surgeries may be due long acting of anesthesia **(Phillips et al., 2012).**

Although previous studies in general and in oncologic surgery have established these associations, few studies have addressed the effect of length of surgery on quality of life in patients undergoing neurological tumors surgery and how it is important to understand that affects. This study aimed to fill this research gap by examining the relationship between duration of surgery and postoperative quality of life in patients with neurological vascular tumors, an emphasis is placed on patient-reported outcomes and functional recovery after surgery

Research Questions

This study examines the following questions.

1. What is the relationship between the duration of surgery and postoperative complications in patients with neurological tumors?

2. How does the duration of surgery affect patient-reported quality of life scores after surgery?

3. In what ways does the duration of surgery affect the rate of recovery in cases of vascular fractures?

These questions aim to clarify the long-term effects of surgery on immediate and long-term postoperative outcomes, with a focus on recovery pathways, quality of life, and independence work primarily on this patient population.

Objectives

The main objectives of this study are as follows.

1. To investigate the relationship between the duration of surgery and postoperative complications, with emphasis on arthritis, infection, and other adverse events.
2. To assess patient-reported quality-of-life scores three to six months after surgery, and to compare outcomes at different operative time points.
3. To clarify trends in rates of functional recovery and overall quality of life during surgery duration categories, providing a clearer vision of how prolonged operative times impact long-term patient independence and well-being.

To achieve these goals, the study provides a microscopic analysis of how surgical time affects key recovery factors and quality of life, thus providing valuable insights for surgical planning and optimal patient care in vascular oncology.

Methodology

Study Design and Population

This retrospective study was conducted at Al-Sadar Teaching Hospital in Basrah and includes data from patients who underwent surgery for vascular tumors from 2017 to 2022. This cohort consists of 450 adult patients with a diagnosis of cerebral palsy primary or metastatic tumors. To

maintain data integrity and control for confounding factors, Multiple -Patients with significant comorbidities or incomplete medical records were excluded from analysis

The retrospective nature of the study allows important data spanning multiple years to be evaluated, increasing both the rigor of the study and the generalizability of the findings While focusing on a homogenous group of patients, such design this aims to reduce the effect of operative time on outcome. Thereby offering a clearer understanding of how prolonged operative times affect both short-term and long-term quality of life in patients undergoing different neurological tumor surgeries.

Data Collection

The dataset included several variables related to surgical outcome and patient well-being. Key variables included duration of surgery, patient demographic details (such as age, sex, and relevant medical history), tumor type (characteristically including size and type), and the incidence of postoperative complications. In addition, SF-36 health assessment was used to assess patients' quality of life, which is a validated instrument measuring physical and mental health at multiple locations. Quality of life data were collected at two follow-up intervals: three months and six months after surgery. This systematic approach to data collection aims to capture a comprehensive profile of each patient's clinical experience and relapse, enabling an in-depth analysis of factors affecting short- and medium-term outcomes is strong.

Statistical Analysis

We used Pearson correlation to examine the association between duration of surgery and postoperative complications. Regression analysis was used to assess the effect of duration of

surgery on quality-of-life scores. Quality of life scores were compared by surgery duration groups (< 4 hours, 4-8 hours, >8 hours) by ANOVA. Significance was set at $p < 0.05$.

Results

Patient Demographics

Table **1** summarizes the key findings of demographic characteristics, a total of 450 patients were included in the study, with an age range spread from 22 to 78 years, giving a mean age (standard deviation ±13) of 55. The age distribution reflects the typical population of tumors treated these types affect them, and more so what happens in middle-aged to older adults.

Regarding tumor type **(Figure 1),** glioma was the most common, accounting for 58% of cases. This was followed by meningiomas with 22% and metastatic lesions with the remaining 20%. This distribution corresponds to the types of brain tumors known to be prevalent in clinical practice, with gliomas predominating due to their high prevalence and invasive nature.

Table 1: Patient demographic characterizations

Variable	**Value**
No of patients	450
Mean age (years)	56 12
Range of age (years)	21-78
Males	320
Females	130

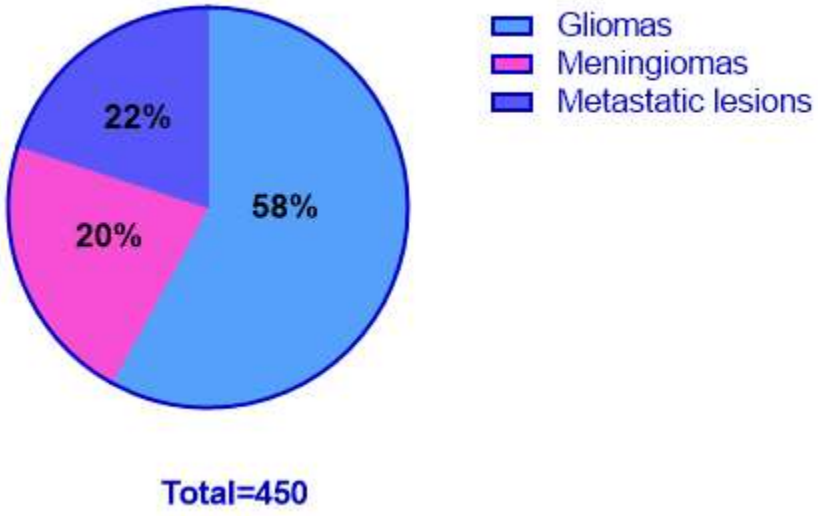

Figure 1: Types of tumors distribution in the patient cohort.

Operation time distribution

As summarized in **Table 2**, the average duration of surgery for this group was 6.5 hours, with individual operations ranging from at least 2 to 12 hours in three different groups: short (less than 4 hours), medium (4 to 8 hours), and long (more than 8 hours). facilitated the analysis of how length of surgery affected clinical outcomes and patient recovery.

Table 2: Categories of surgical duration

Category	Operation time (hr)	Patient numbers	Percent of Cohort
Short duration	<4	110	24.4%
Medium duration	4-8	240	53.3%
Long duration	>8	100	22.2%

Positive Expected Results

i. Postoperative complications

The resulting coefficient revealed a statistically significant positive association between the length of surgery and the likelihood of postoperative complications Patients in the longer-term group (surgery >8 hours) showed a higher rate of complications each showed, mainly with infection and low incidence of rheumatoid arthritis, suggesting that the protective effect was low associated with shorter operative time **(Table 3, and Figure 2).**

Table 3: Incidence of post-operative complications by duration of surgery.

Duration of operation	Rate of complications	Most common complications
Short duration (<4 hrs)	15%	Mild infection, mild neurological symptoms
Moderate duration (4-8 hrs)	29%	Infection, mild to moderate neurological symptoms
Long durations (>8 hrs)	42%	Sever infection, notable neurological symptoms

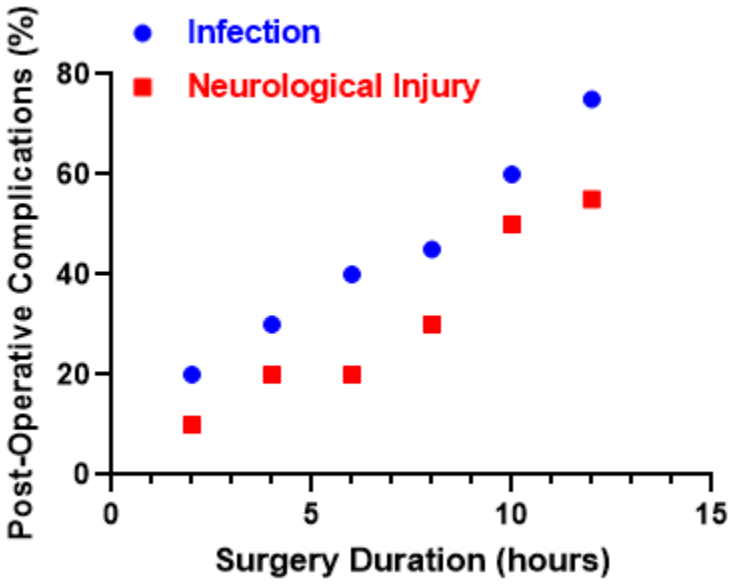

Figure 2. Rates of postoperative complications by duration of surgery.

The duration of surgery shows a positive correlation with postoperative complication rates. As expected, patients undergoing prolonged surgery experience more complications, which can affect recovery and quality of life.

ii. Quality of Life Scores

SF-36 quality-of-life scores, which measure various physical and mental health factors, showed a clear correlation with the duration of surgery. Patients who underwent short surgery (< 4 hours) reported significantly higher scores in physical functioning, mental health, and general well-being three and six months after surgery. In contrast, patients who underwent longer surgery (> 8 hours) reported lower scores in these areas, preceded by slower recovery and reduced perceived quality of life Stress **(Figure 3).**

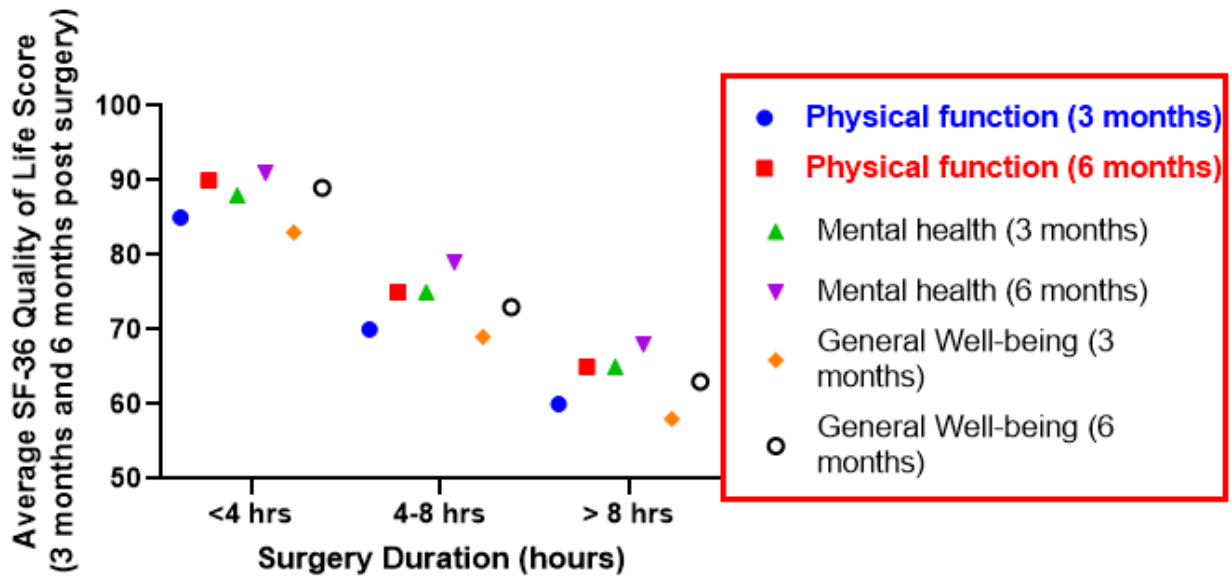

Figure 3. Quality of life scores by duration of surgery group (SF-36 scores at three to six months). Show an expected association between the duration of surgery and quality of life (QoL) scores up to three months after surgery. Patients with shorter operative time (< 4 hours) reported higher QoL scores, whereas those with longer period (>8 hours) showed the lowest QoL score This is indicative of the longer operation is associated with lower survival due to higher complication rates and slower recovery support the hypothesis.

iii. Functional Configuration

Functional fitness assessed by patient-reported measures showed faster improvement in the short-term group compared with the long-term group. By six months, fewer patients had surgery some (< 4 hours) tended to return to a physiological state of almost initial function, continue to report their assigned physiological limitations, where scores were significantly lower than their baseline levels indicating prolonged recovery **(Table 4).**

Table 4: Status of functional recovery by surgery duration (Six Months Post-Operative).

Duration of operation	% of patients at baseline physical function	% of patients below baseline physical function
Short duration (<4 hrs)	91%	9%
Moderate duration (4-8 hrs)	75%	25%
Long durations (>8 hrs)	52%	48%

Discussion

The findings of this study reveal a striking relationship between the duration of surgery and postoperative outcomes, with longer surgery being associated with higher complication rates, slower recovery and lower quality of life in patients in vascular tumors are consistent This is consistent with the existing literature in surgical fields may increase the risk and affect patient well-being **(Cheng et al., 2018; Kim et al., 2014; Nowak and Schemitsch, 2019).**

The data reveal a clear trend: patients who underwent longer surgery (>8 hours) had a higher rate of complications (42%), mainly infection, and significant neurological deficit greater compared with patients in the group who underwent shorter operative time (< 4 hours), that align with the prior work **(Golebiowski et al., 2015; Leong et al., 2006)**. These findings, which tended to be limited to mild infections and minor neuropathies, were consistent with **Cheng et al and colleagues (2018**), who revealed that prolonged operative time was associated with an increased risk of outcome due to prolonged anesthesia and potential intraoperative complications (**Cheng**

et al., 2018). This study highlights its importance need to reduce operative time where possible to reduce postoperative risks severity The strength is already sufficient happen.

The impact of the duration of surgery extended beyond immediate complications to affect patient-reported quality of life. Patients in the short-duration group reported higher quality-of-life scores in areas such as physical functioning, mental health, and general well-being three and six months after surgery. This was aligned with **Immer et al., (2004)** that reported short duration reported improvement of quality of life after thoracic aorta surgery **(Immer et al., 2004).** In contrast, patients who underwent longer surgery (> 8 hours) consistently reported lower scores Shown These results are consistent with the findings of **Denker et al. (2021),** who reported that delayed surgery can delay recovery and reduce long-term quality of life due to postoperative fatigue, physical limitations, and psychological stress **(Dencker et al., 2021). Additionally, Berling Holm et al., (2017)** documented the relationship between duration of surgery and the post-operative quality of life **(Berling Holm et al., 2017).**

Functional recovery also showed a strong correlation with the duration of surgery. By six months of follow-up, 91% of patients in the short-duration surgery group had returned to baseline levels of physical activity, whereas only 52% of patients in the long-duration surgery group had the same activity. This chronic disorder can have a significant impact on the daily life and independence of patients, especially those whose surgery involves major neurological functions. **Procteret al. (2010),** who reported that delayed surgical time was associated with delayed activity, which could be due to greater physiological stress and inflammatory response associated with delayed surgery in addition to increased length of hospital stay **(Procter et al., 2010). Furthermore, Kim et al., (2015)** reported that there was a relationship between surgical

duration and risk of thromboembolism **(Kim et al., 2015).** In addition**, Murphy et al., (2016)** reported that longer duration of surgery for benign cranial nerve tumors liked with elevated risk of mortality post-operatively **(Murphy et al., 2016).**

Implications for surgical planning

Because operative delay was associated with outcome, it may be beneficial for surgical teams to perform better preoperative planning and explore strategies to reduce operative time without inducing tumor removal leave properly does not damage Possible options are:

Enhanced preoperative mapping: use of advanced imaging and neuro-navigation to reduce intraoperative decision-making time.

Customized groups: Specialized surgical groups assigned to specific areas of surgery to improve effectiveness in complex cases.

The use of such strategies can improve patient recovery and quality of life after surgery, especially in cases where extensive surgery is anticipated

Limitations

While the study provides valuable insights, it is not without limitations. First, the external design limits the ability to establish causality. Although the relationship between operative length and various outcomes is clear, confounding variables such as tumor complexity or surgical experience may affect outcome. Furthermore, reliability SF-36 to assess quality of life, although validated, may not adequately capture the microscopic aspects of recovery in rheumatoid arthritis patients have not done so, and may include methodology buy them and how hard it is.

Conclusion

This study discloses that longer durations of surgery are significantly associated with elevated complication rates, slower functional recovery, and diminished quality of life especially in patients undergoing neurological tumor surgeries. These outcomes suggest that, where feasible, minimizing operative period could improve post-operative outcomes and enhance the overall recovery experience for patients. Given the unique demands of neurological surgeries, these insights are especially pertinent for optimizing surgical planning and improving long-term quality of life in this vulnerable patient group.

Suggestions for the future

Future research should focus on prospective studies controlling for potential confounding factors, such as tumor complexity and surgical team experience, to determine the effect of operative duration on outcome occurs exactly. In the search for reducing operative time. How enhanced preoperative mapping and specialty surgical teams-may provide useful strategies for improving outcomes in complex cases. Finally, the inclusion of a larger primary quality-of-life assessment of cognitive and motor function may provide a more comprehensive view of recovery in neurosurgical patients.

References:

Berling Holm K, Knutsson J, Strömbäck K, Danckwardt Lilliestrom N, Papatziamos G, Rosenblad A and Von Unge M (2017) Taste disturbance after stapes surgery: an evaluation of frequency, severity, duration, and quality-of-life. *Acta oto-laryngologica* **137**:39-43.

Broggi M, Ferroli P, Schiavolin S, Zattra C, Schiariti M, Acerbi F, Caldiroli D, Raggi A, Vetrano I and Falco J (2023) Surgical complexity and complications: the need for a common language, in *Complications in Neurosurgery* pp 1-12, Springer.

Cheng H, Chen BP-H, Soleas IM, Ferko NC, Cameron CG and Hinoul P (2017) Prolonged operative duration increases risk of surgical site infections: a systematic review. *Surgical infections* **18**:722-735.

Cheng H, Clymer JW, Chen BP-H, Sadeghirad B, Ferko NC, Cameron CG and Hinoul P (2018) Prolonged operative duration is associated with complications: a systematic review and meta-analysis. *Journal of Surgical Research* **229**:134-144.

de Loubresse CG (2014) Neurological risks in scheduled spinal surgery. *Orthopaedics & Traumatology: Surgery & Research* **100**:S85-S90.

Dencker EE, Bonde A, Troelsen A, Varadarajan KM and Sillesen M (2021) Postoperative complications: an observational study of trends in the United States from 2012 to 2018. *BMC surgery* **21**:393.

Duchman KR, Pugely AJ, Martin CT, Gao Y, Bedard NA and Callaghan JJ (2017) Operative time affects short-term complications in total joint arthroplasty. *The Journal of arthroplasty* **32**:1285-1291.

Fujibuchi T, Miyawaki J, Kidani T and Miura H (2017) Risk factors for neurological complications after operative treatment for schwannomas. *Journal of Clinical Neuroscience* **46**:136-140.

Golebiowski A, Drewes C, Gulati S, Jakola AS and Solheim O (2015) Is duration of surgery a risk factor for extracranial complications and surgical site infections after intracranial tumor operations? *Acta neurochirurgica* **157**:235-240.

Heimans JJ and Reijneveld JC (2012) Factors affecting the cerebral network in brain tumor patients. *Journal of neuro-oncology* **108**:231-237.

Immer FF, Lippeck C, Barmettler H, Berdat PA, Eckstein FS, Kipfer B, Saner H, Schmidli Jr and Carrel TP (2004) Improvement of quality of life after surgery on the thoracic aorta: effect of antegrade cerebral perfusion and short duration of deep hypothermic circulatory arrest. *Circulation* **110**:II-250-II-255.

Kim BD, Hsu WK, De Oliveira Jr GS, Saha S and Kim JY (2014) Operative duration as an independent risk factor for postoperative complications in single-level lumbar fusion: an analysis of 4588 surgical cases. *Spine* **39**:510-520.

Kim JY, Khavanin N, Rambachan A, McCarthy RJ, Mlodinow AS, De Oliveria GS, Stock MC, Gust MJ and Mahvi DM (2015) Surgical duration and risk of venous thromboembolism. *JAMA surgery* **150**:110-117.

Leong G, Wilson J and Charlett A (2006) Duration of operation as a risk factor for surgical site infection: comparison of English and US data. *Journal of Hospital Infection* **63**:255-262.

Murphy M, Gilder H, McCutcheon BA, Kerezoudis P, Rinaldo L, Shepherd D, Maloney P, Snyder K, Carlson ML and Carter BS (2016) Increased operative time for benign cranial nerve tumor resection correlates with increased morbidity postoperatively. *Journal of Neurological Surgery Part B: Skull Base* **77**:350-357.

Nowak L and Schemitsch E (2019) Duration of surgery affects the risk of complications following total hip arthroplasty. *The Bone & Joint Journal* **101**:51-56.

Park S-H, Shin Y-R, Hur H, Lee CM, Min JS, Ryu SW, Chae HD, Jeong O, Choi C-I and Song K-Y (2023) Exploring ideal operative time for best outcomes in gastric cancer surgery: A multi-institutional study based on KLASS-07 database. *Chinese Journal of Cancer Research* **35**:660.

Peltrini R, Luglio G, Cassese G, Amendola A, Caruso E, Sacco M, Pagano G, Sollazzo V, Tufano A and Giglio MC (2019) Oncological outcomes and quality of life after rectal cancer surgery. *Open Medicine* **14**:653-662.

Phillips BT, Wang ED, Rodman AJ, Watterson PA, Smith KL, Finical SJ, Eaves III FF, Beasley ME and Khan SU (2012) Anesthesia duration as a marker for surgical complications in office-based plastic surgery. *Annals of plastic surgery* **69**:408-411.

Procter LD, Davenport DL, Bernard AC and Zwischenberger JB (2010) General surgical operative duration is associated with increased risk-adjusted infectious complication rates and length of hospital stay. *Journal of the American College of Surgeons* **210**:60-65. e62.