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Impact of Early Postoperative Complications on Short-term Functional Outcomes, Quality of Life, and Patient Satisfaction Following Retrosigmoid Craniotomy for Cerebellopontine Angle Tumors: A Prospective Cohort Study at AAU, BLH & MCM Hospitals.

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Table of Contents

Tables and Figures.

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Acronyms/Abbreviations

CPA Cerebellopontine angle
RSC Retrosigmoid craniotomy
CSF Cerebrospinal fluid
SF-36 Short Form 36 Health Survey
GOS Glasgow Outcome Scale
KPS Karnofsky Performance Scale
FDI Facial Disability Index
PROM Patient Reported Outcome measure
QoL Quality of Life
PSQ-18 patients' satisfaction questionnaire 18
BLH Black Lion Hospital
MCM Myungsung Christian Medical Center
AAU Addis Ababa University
STROBE Strengthening the Reporting of Observational Studies in Epidemiology
SPSS Statistical Package for the Social Sciences
MRN Medical Record Number
ABM abnormal body movement
DM Diabetes mellitus
HTN hypertension
rt right
lt left
GCS Glasgow Coma Scale
CN cranial nerves
HCP Hydrocephalus
MRI Magnetic Resonance Imaging
cm^3 cubic centimeter
VS vestibular schwannomas
CMI chronic medical illness

GOS-E Glasgow outcome scale extended

ABSTRACT

Introduction: The retrosigmoid craniotomy is effective for cerebellopontine angle tumors but poses risks like facial nerve dysfunction. Limited studies have examined the impact of postoperative complications on quality of life, indicating a need for comprehensive research. This study used validated instruments to assess these effects on patients' well-being.

Method: This prospective cohort study examined early postoperative complications following retrosigmoid craniotomy for cerebellopontine angle tumors,and its effect on Short-term patients' quality of life and satisfaction at two hospitals in Addis Ababa, Ethiopia.Adhering to STROBE guidelines, data were collected online using KoboToolbox and included preoperative and postoperative follow-ups at multiple intervals (at day 1,7,14,30,90). The study period ran from September 1, 2023, to October 31, 2024, with data analyzed using SPSS.

Result: During the study, 40 patients underwent surgery, with a slight female majority (52.5%). The mean age was 40.80 years, with the largest age group being 31-40 years. Common preoperative symptoms included headaches (95%), loss of balance (82.5%), and hearing loss (72.5%), with an average symptom duration of 25.4 months. Cranial nerve VIII involvement was noted in 67.5% preoperatively and increased to 80% postoperatively, while cranial nerve VII involvement rose dramatically from 27.5% to 92.5%. All patients had retrosigmoid craniotomies, with 55% diagnosed with preoperative hydrocephalus. Among tumor resection outcomes, 47.5% achieved gross total resection, and the most prevalent tumor type was vestibular schwannoma (51.3%). Complications included motor weakness (12.5%) and tumor bed intracranial hemorrhage (10%), with a 10% mortality rate by three months. Functional outcomes showed that 60% achieved lower good recovery on the Glasgow Outcome Scale Extended (GOSE). Significant correlations were found between complications and poorer outcomes. Quality of life improved significantly postoperatively, especially in physical function and pain, with 70% of patients expressing high satisfaction and 44.4% reporting enhanced quality of life after surgery, highlighting the positive effects of the intervention.

Conclusion: This study emphasizes the key factors influencing outcomes in cerebellopontine angle (CPA) tumor surgeries, revealing a predominance of younger patients with symptoms such as headaches, balance issues, and hearing loss, which necessitate timely intervention. The strong correlation between preoperative hydrocephalus and previous shunting highlights the need for careful evaluations prior to surgery. While tumor resection and post-surgical quality of life improvements are encouraging, complications like cranial nerve VII (facial nerve) palsy can negatively impact patient satisfaction. Overall, the findings stress the importance of thorough preoperative assessments, effective surgical management, and attentive postoperative care to enhance outcomes and patient experiences. Future research should focus on long-term evaluations of these interventions' impacts on quality of life.

Keywords: **Retrosigmoid Craniotomy**, **Cerebellopontine Angle Tumors , Postoperative Complications , Cranial nerve VII , Short-term Outcomes , Quality of Life , Patient Satisfaction, GOSE, Neurosurgery**

Introduction

Background

The cerebellopontine angle (CPA) is a triangular region located in the posterior cranial fossa. It is anatomically defined by the tentorium superiorly, the brainstem posteromedially, and the petrous portion of the temporal bone posterolaterally. Clinically, it is a significant landmark as it contains the CPA cistern, which houses cranial nerves V, VI, VII, and VIII, along with the anterior inferior cerebellar artery (1)

Cerebellopontine angle (CPA) tumors can be either benign or malignant and develop within this region, situated at the junction between the posterior and middle cranial fossae. The most frequently encountered CPA tumors include vestibular schwannomas (commonly referred to as acoustic neuromas), meningiomas, and epidermoid cysts. Depending on their size and precise location, these tumors may present with symptoms such as hearing impairment, tinnitus, vertigo, facial numbness or weakness, headaches, nausea, and vomiting.

Retrosigmoid craniotomy (RSC) is one of the surgical techniques employed for the excision of CPA tumors. This approach involves making an incision behind the ear and removing a small section of skull bone to access the CPA region. The tumor is then meticulously separated from adjacent structures and excised. Compared to alternative surgical methods, RSC offers several benefits, including better preservation of hearing function, reduced brain retraction, and direct visualization of the tumor and cranial nerves.

Surgery involving the CPA has historically posed considerable challenges. The first documented successful complete removal of a CPA tumor was performed in 1894 by Sir Charles Balance. Using a right posterior fossa craniectomy, the tumor was excised with an unsterilized finger inserted between the tumor and the pons. Despite resulting in complete facial palsy and facial anesthesia, the patient recovered and lived for at least 18 years. Later, H. Cushing significantly improved surgical outcomes by reducing mortality and complication rates through intracapsular tumor removal techniques (2)

In contemporary clinical practice, patient-centered care has gained increasing importance. Health outcomes are now often evaluated using patient-reported outcome measures (PROMs), which reflect patients' perspectives. Examples of these measures include quality of life assessments and self-rated health evaluations. Additionally, satisfaction with careis assessed through patient-reported experience measures, providing insights into the perceived quality of care received (3)

Statement of the problem

Retrosigmoid craniotomy, while effective, is associated with several postoperative complications that may impact patient recovery and overall outcomes. Common complications include surgical site infections, meningitis, cerebrospinal fluid (CSF) leakage, hydrocephalus, hemorrhage, seizures, and cranial nerve injuries. These adverse events can lead to increased patient morbidity and mortality, as well as higher healthcare costs and greater resource utilization.

Despite the clinical significance of these complications, systematic data on their incidence, risk factors, and impact on functional outcomes following retrosigmoid craniotomy for CPA tumors remain limited. Existing studies were often retrospective, conducted at single centers, or

involved small sample sizes. Additionally, there was insufficient evidence regarding how functional outcomes influence patient satisfaction after surgery.
This gap highlighted the need for a prospective cohort study to provide comprehensive and reliable data on the frequency of early postoperative complications, short-term functional outcomes, and quality of life. Such a study could also shed light on the relationship between these outcomes and patient satisfaction following retrosigmoid craniotomy for CPA tumors.

Significance of this study

Understanding the occurrence of early postoperative complications following retrosigmoid craniotomy is essential for improving patient outcomes. Identifying risk factors enables healthcare providers to implement targeted strategies that reduce complications and support recovery. This proactive approach allows medical teams to address potential challenges early, ultimately leading to better patient results.
Evaluating patients' quality of life (QoL) after surgery offers important insights into their physical, psychological, and social well-being. This study seeks to examine how postoperative complications influence daily activities, functional abilities, and overall satisfaction. Gaining a deeper understanding of these aspects of QoL enables healthcare providers to design focused interventions aimed at improving patients' long-term well-being.
Surgeons can utilize knowledge of associated risk factors to make more informed decisions during preoperative planning. Recognizing modifiable factors allows for preventative measures to minimize complications. Integrating this data into surgical planning enhances patient safety and optimizes clinical outcomes.
Patient satisfaction is a vital measure in modern healthcare. Investigating satisfaction levels following surgery helps advance patient-centered care and improve overall experiences. Addressing patient concerns and enhancing satisfaction not only benefits individual patients but also strengthens trust and confidence in the healthcare system as a whole.

Literature review

Overview

The retrosigmoid craniotomy approach is frequently employed for the resection of cerebellopontine angle (CPA) tumors, yielding favorable outcomes in most cases, though not without potential complications. Several studies have reported high rates of total or near-total tumor removal using this method. For instance, (4)documented complete tumor resection in 62.5% of 456 cases, along with satisfactory facial nerve function in 82% of patients. Similarly, (5)highlighted the use of an endoscopic transnasal approach for a complex schwannoma, enabling subtotal resection without neurological deficits.

Despite these successes, complications remain a concern. (5)reported a 10% rate of incomplete tumor removal, a 3.2% incidence of hydrocephalus requiring shunting, and a 2.1% mortality rate in a series of 48 cases. (6)described the resection of an epidermoid cyst, emphasizing the importance of achieving complete tumor removal while preserving cranial nerve function. Furthermore, (7)discussed the management of vestibular schwannomas, noting risks such as

intraoperative blood loss, cerebrospinal fluid (CSF) leaks, and complications associated with the sitting position.

Rare but severe complications have also been reported. For example, (8)described the resection of an epidermoid cyst involving multiple cranial nerves and the vertebrobasilar system, underscoring the need for safe yet maximal tumor resection. Meanwhile, (9)presented an unusual case of an ectopic craniopharyngioma recurrence in the CPA just four months after initial surgery, highlighting the importance of close postoperative monitoring.

A retrospective study examining 72 patients who underwent CPA surgery between January and August 2007 identified keratitis as a common postoperative issue in patients with otherwise satisfactory facial function, increasing the risk of severe dysfunction (10). Preoperative counseling was recommended to address subtle signs of facial dysfunction.

Postoperative complications were further detailed by (11) who reported facial palsy rates of 75% in patients with gross total resection (GTR), 62.5% in those with near-total resection (NTR), and 25% in cases of subtotal resection (STR). Additional complications included CSF leaks at the surgical site in 16.4% of patients, meningitis in 13%, and new-onset facial nerve palsy in 60% of cases. Functional facial nerve preservation rates were low, leading researchers to advocate for improved microsurgical techniques and the use of neuromonitoring to optimize outcomes.

A prospective study reported overall morbidity (both subjective and objective) in 46.4% of patients postoperatively. However, 94% of patients expressed high satisfaction despite complications. Lower satisfaction levels at 30 days were not linked to major morbidity but rather to functional dependence (mRS score ≥3), minor infections, poor subjective health status, and severe symptoms such as double vision and balance issues (12).

In conclusion, the retrosigmoid approach facilitates effective resection of CPA tumors while generally preserving nerve function. However, surgeons must remain vigilant about risks such as subtotal tumor removal, neurological deficits, CSF-related complications, and rare but serious recurrences or postoperative events ((4), (13), (5), (6), (7), (8), (9)). Close follow-up is essential to detect problems early. With careful patient selection and refined microsurgical techniques, this approach continues to be a valuable tool for addressing complex posterior fossa lesions.

Although some studies have evaluated the impact of postoperative complications on quality of life (QoL) following retrosigmoid craniotomy for CPA tumors, these investigations varied in methods and instruments used. Tools such as the Short Form 36 Health Survey (SF-36), Glasgow Outcome Scale (GOS), Karnofsky Performance Scale (KPS), and Facial Disability Index (FDI) highlighted adverse effects on physical, emotional, social, and functional aspects of QoL.

However, these studies often suffered from small sample sizes, short follow-up periods, and limited outcome measures. Consequently, there was a need for a more comprehensive and longitudinal study employing validated and specific tools to assess the impact of complications on QoL after retrosigmoid craniotomy for CPA tumors. This study addressed these gaps by utilizing PROMs such as the Short Form 36 Health Survey (SF-

36) both preoperatively and postoperatively. Additionally, it evaluated patient satisfaction using the PSQ-18 and Glasgow Outcome Scale Extended.

Conceptual framework

To guide the analysis, the principal investigator developed a customized conceptual framework based on existing literature to examine the factors influencing surgical outcomes of retrosigmoid craniotomy (RSC) and cerebellopontine angle (CPA) tumor resection. The investigator proposed that these factors interact in various ways to affect outcomes. This framework identifies socio-demographic characteristics, clinical background details, and management-related variables as key determinants potentially impacting surgical results.

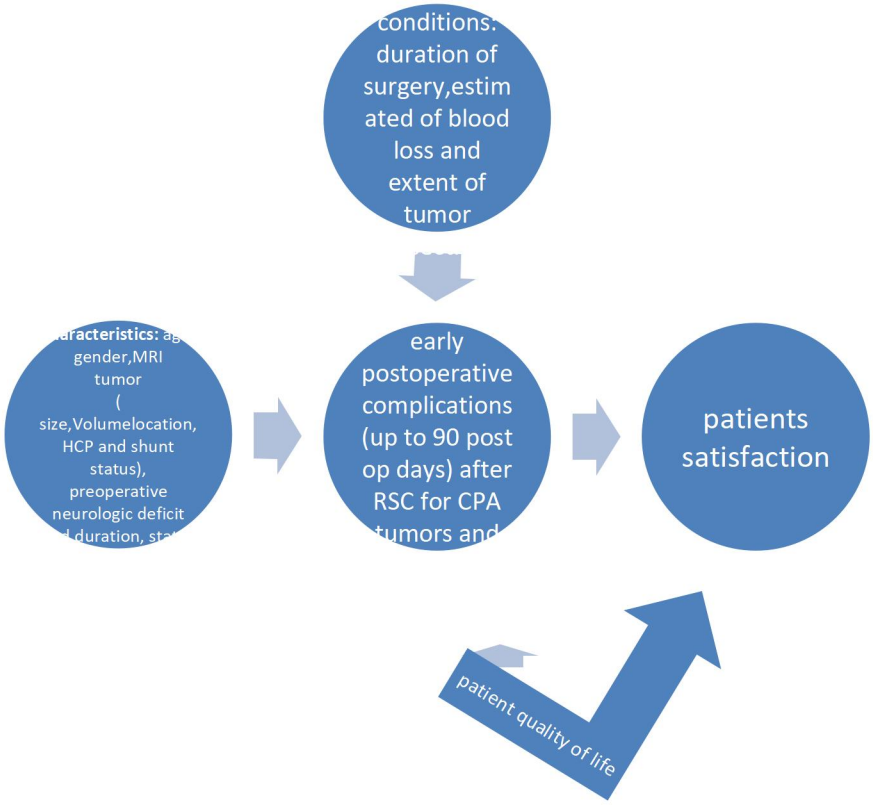


Figure 1. Conceptual framework of Early Postoperative Complications and associated risk factors After Retrosigmoid Craniotomy for Cerebellopontine Angle Tumors; patients' quality of life and satisfaction

Objective of study

General objective

- ✓ To evaluate the impact of early postoperative complications on short-term functional outcomes, quality of life, and patient satisfaction following retrosigmoid craniotomy for cerebellopontine angle tumors.

Specific objective

To identify the types and frequency of early postoperative complications encountered in patients undergoing retrosigmoid craniotomy for cerebellopontine angle tumors, until 3 months post op.

To assess the short-term functional outcomes of patients following retrosigmoid craniotomy, using standardized assessment tools, at 3 months post op.

To evaluate the quality of life of patients postoperatively, utilizing validated questionnaires, at 3 months post op.

To measure patient satisfaction regarding their surgical experience and outcomes, using a structured satisfaction survey, at 3 months post op.

To analyze the relationship between early postoperative complications and short-term functional outcomes, quality of life, and patient satisfaction.

To provide recommendations for clinical practice based on the findings to enhance patient outcomes and satisfaction following retrosigmoid craniotomy.

Methods and Materials

Study area

This study used a prospective cohort design to investigate the *impact of early postoperative complications on short-term functional outcomes, quality of life, and patient satisfaction following retrosigmoid craniotomy for cerebellopontine angle tumors.* The study was conducted at two Comprehensive Specialized Hospitals, BLH &MCM, in Addis Ababa, Ethiopia that perform this surgery.

BLH is the largest and oldest public hospital in the country, offering advanced clinical care to millions of patients and serving as a training center for health science students from across the nation and the Horn of Africa. This 850-bed teaching hospital includes a surgical department that provides specialized neurosurgical care. The neurosurgery services are delivered by consultant neurosurgeons, resident physicians, trained nurses, and clinical pharmacists.
In contrast, MCM is a private hospital located in the southeastern part of the capital city. With 210 beds and approximately 32,964 annual admissions, it is recognized for offering neurosurgical care to patients referred from various centers.

Neurosurgical training in Ethiopia began in 2006 through collaboration with the University of Bergen in Norway. Today, the program operates independently, managed by local neurosurgeons. Both hospitals perform emergency and elective neurosurgical procedures daily. Currently, 14 local neurosurgeons and 36 neurosurgery residents are actively providing services at these facilities.

Study design and period

The study is prospective cohort which followed the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines for reporting observational studies.Data was collected online using kobo toolbox by clerking the patient and checking their investigation. The follow up was at preoperative period after admission to ward, then in the following post operative days; day 01, day 03, day 07, day 14, day 30, and day 90. Collected data was coded and exported into SPSS. Data was analyzed using SPSS version 26 software. Descriptive statistics are presented with frequency table, graph and charts.

The study period ran from September 1st 2023 to October 31th 2024 G.C.

Population

All adult Patients (aged 18 years or older) who underwent RSC for CPA tumors at these two hospitals during the study period.

Inclusion and exclusion criteria

Inclusion

- ✓ Patients who have a confirmed diagnosis of CPA tumor through pre-operative imaging studies
- ✓ Patients who underwent RSC between a specific time frame

exclusion criteria

- ✓ Patients with CPA tumor that was not surgically treated
- ✓ Patients who underwent surgery different than RSC approach.

Sample size determination and Sampling technique

Sample size determination

- ✓ This study included all adult Patients who underwent RSC and tumor resection for CPA tumors in the specified study period

Sampling technique

- ✓ The study employed census method as its sampling technique as each consecutive eligible patient was planned to be included in the study

study variables

Dependent variable

- ✓ Incidence of all post-operative complication until 90th post-operative day (CN palsy, CSF leak, meningitis…)
- ✓ PROM, SF-36
- ✓ GOS-E
- ✓ PSQ-18

Independent variable

- ✓ Age
- ✓ Gender
- ✓ preoperative neurologic symptoms and duration
- ✓ history of chronic medical illness
- ✓ preoperative KPS score
- ✓ preoperative GCS score
- ✓ preoperative cranial nerve palsy
- ✓ side of CN palsy
- ✓ Tumor size, volume and location
- ✓ HCP and shunting status
- ✓ Duration of surgery
- ✓ Estimated blood loss
- ✓ Extent of tumor resection
- ✓ Ambulation time post-op
- ✓ Post-op hospital stay
- ✓ Biopsy result

Operational definition

- ◊ Operational Definition for "Early Postoperative Complications"
  - ✓ Concept: We're interested in complications that occur shortly after a retrosigmoid craniotomy.
  - ✓ Operational Definition:
    - Time Frame: We considered complications that arose within the first 90 days after the surgery.
    - Specific Complications: These included but were not limited to:
    - Surgical Site Infection: Any signs of infection (e.g., fever, swollen or painful incision site, drainage).
    - Meningitis: Inflammation of the meninges.
    - Cerebrospinal Fluid (CSF) Leaks: Abnormal leakage of CSF.

- Hydrocephalus: Accumulation of fluid in the brain.
- Swelling/Expansion: Increased intracranial pressure due to swelling.
- Elevated Intracranial Pressure (ICP): Abnormal pressure within the skull.
- Herniation: Displacement of brain tissue.
- Measurement Criteria: Diagnosis by clinical assessment, imaging, or laboratory findings.

◊ Operational definition for Short-term patients' functional outcome
– GOS-E(Glasgow outcome scale extended) was used

◊ Operational Definition for "Effect on Patient Quality of Life and Satisfaction":
✓ Concept: We wanted to understand how these complications impact patients' well-being and satisfaction.
✓ Operational Definition :Quality of Life (QoL):

- Measurement Tools: We used validated QoL assessment scales (e.g., SF-3EQ-5D).
- Domains: Physical health, mental health, social functioning, pain, and overall well-being.
- Scoring: Scores will be quantified and compared.
- Patient Satisfaction:
- Surveys: Administer patient satisfaction surveys, using validated PSQ18 assessment scales (e.g., Likert scale).
- Questions: Ask about overall satisfaction, pain management, communication, and functional outcomes.

* In this study, patient satisfaction was assessed through a questionnaire administered to both current patients and close attendants of deceased patients or severely disabled patients. Close attendants, defined as family members or caregivers who were actively involved in the patient's care, provided insights into the patient's healthcare experience, including communication, quality of care, and overall satisfaction. This approach aimed to capture a comprehensive view of patient experiences, ensuring that feedback reflected the perspectives of both living patients and those who may have been unable to respond due to severe health conditions.

- Scoring: Quantified responses and analyzed trends

Data quality management

An English-language checklist was utilized to gather data. Prior to the start of data collection, brief training was provided to the data collectors (two healthcare professionals) on the data collection process. During the data collection, close supervision was ensured, and the completed checklists were double-checked daily by the data collectors and the principal investigator to ensure consistency and completeness before analysis.

Data processing and analysis

The collected data were cleaned and entered into SPSS version 26, where variables were systematically organized for analysis. Socio-demographic characteristics were summarized and presented in tables. For continuous variables, frequency, mean, and distribution metrics were calculated. To identify risk factors associated with outcome variables, chi-square tests and Fisher's exact tests were applied, with a p-value < 0.05 considered statistically significant. The study results were presented using text, tables, and figures.

Overall patient satisfaction was classified into two categories: low (very poor, poor, or satisfactory) and high (good or excellent). Subjective postoperative health status was grouped into three categories—better, same, or worse—based on comparisons between preoperative and postoperative assessments.

Ethical consideration

Ethical approval was granted by the Review Committee of the Neurosurgery Unit within the Department of Surgeryat the College of Health Sciences, Addis Ababa University. A permission letter was submitted to the directors of the study hospitals by the Department of Surgery to authorize the study. Following this, the data collectors were introduced to the onsite practitioners. The collected data was maintained with strict anonymity and confidentiality.

Dissemination of the study findings

The results of this study were submitted to the Neurosurgical Unit of the Department of Surgery at the College of Health Sciences, Addis Ababa University, as part of the requirements for the specialty certificate in Neurosurgery. The findings were also shared with relevant stakeholders through presentations at various workshops and seminars. Lastly, the manuscript was submitted to a peer-reviewed scientific journal for potential publication.

RESULTS

Socio demographic pattern

During the study period, a total of 40 patients underwent surgery, 28 (or 70%) at BLH, while the remaining 12 patients (or 30%) had their operations at MCM Hospital ,with a slight majority being female (52.5%, n=21) compared to male patients (47.5%, n=19). The largest age group was 31-40 years (37.5%, n=15), followed by 41-50 years (27.5%, n=11), 18-30 years (17.5%, n=7), 51-60 years (12.5%, n=5), and the smallest group being those aged 61-70 years (5%, n=2)

Table 1. Ages ranged from 18 to 65 years, with a standard deviation of 11.09 years. The mean age of the participants was 40.80 years (SD = 11.094)

Table 1

Socio demographic pattern of study population between September 1, 2023, till October 31, 2024. (n = 40).

Variables		Frequency	Percent
Gender	Male	19	47.50%
	Female	21	52.50%
Age Group	18-30 yr	7	17.50%
	31-40 yr	15	37.50%
	41-50 yr	11	27.50%
	51-60 yr	5	12.50%
	61-70 yr	2	5%

The clinical presentations

The preoperative symptoms experienced by patients revealed several noteworthy findings. The most prevalent symptom was headache, reported by 95% of participants (n=38), followed by loss of balance in 82.5% (n=33) and hearing loss in 72.5% (n=29). Additional significant symptoms included tinnitus (55%, n=22), vertigo (52.5%, n=21), and nausea/vomiting (40%, n=16). Other reported symptoms were facial numbness (32.5%, n=13), visual deterioration (32.5%, n=13), and choking episodes (27.5%, n=11). Less frequently observed symptoms included facial weakness (20%, n=8), body weakness (12.5%, n=5), chronic medical illnesses (only hypertension was noted) (12.5%, n=5), dysarthria (voice change) (10%, n=4), and urinary incontinence (2.5%, n=1) Table 2.The average duration of symptoms was approximately 25.4 months, with a median of 24 months, and a range from 5 to 120 months. Statistically significant findings from the binomial test included headache (p = .000), balance loss (p = .000), hearing loss (p = .006), facial numbness (p = .038), facial weakness (p = .000), body weakness (p = .000), abnormal body movement (p = .000), and choking episodes (p = .006).

Cranial nerve involvement was significant among the patients, with cranial nerve VIII (CNVIII) being the most commonly affected preoperatively, impacting 27 patients (67.5%), and increasing to 32 patients (80.0%) postoperatively. Notably, cranial nerve VII (CNVII) exhibited a remarkable rise in prevalence, increasing from 11 patients (27.5%) preoperatively to 37 patients (92.5%) postoperatively. Additionally, other cranial nerves also showed increased frequencies following surgery, with cranial nerve V (CNV) rising from 10 patients (25%) to 16 patients (40.0%) and cranial nerve VI (CNVI) increasing from 2 patients (5%) to 8 patients (20.0%). These findings underscore the significant changes in cranial nerve involvement before and after surgery, particularly highlighting the pronounced increase in CNVII Table 3.

There was an increase in the severity of facial nerve palsy postoperatively, particularly noted in the rise of patients classified as Grade IV and Grade V, indicating a shift towards more severe grades after the procedure Table 4. Preoperative Glasgow Coma Scale (GCS) scores ranged from 13 to 15, reflecting a relatively high level of consciousness among participants, accompanied by a low standard deviation of 0.316. Additionally, preoperative Karnofsky Performance Scale

(KPS) scores ranged from 50 to 90, with a median score of 80, highlighting the overall functional status of patients before surgery.

The preoperative MRI tumor volumes ranged from a minimum of 5.25 cm^3 to a maximum of 78.50 cm^3, with a standard deviation of 15.50 cm^3. The average tumor size was 4.49 cm, while the median size was slightly smaller at 4.47 cm. Tumor dimensions varied between 2.50 cm and 6.60 cm, with a standard deviation of 0.98 cm. Of the tumors assessed, 11 (27.5%) were classified as medium-sized, measuring between 2 to 4 cm, while a significant majority, consisting of 29 tumors (72.5%), were categorized as large, with sizes exceeding 4 cm. This distribution underscores the predominance of larger tumors within the sample.

In a crosstabulation of tumor size and postoperative CN VII palsy, 9 of 11 patients with medium-sized tumors (2-4 cm) and 28 of 29 patients with large tumors (>4 cm) developed CN VII palsy postoperatively, resulting in 37 of 40 patients experiencing palsy overall. While larger tumors seemed more likely to cause CN VII palsy, Pearson Chi-Square tests showed no significant association ($p = 0.114$), indicating that tumor size alone may not be a statistically significant predictor of postoperative facial nerve dysfunction.

Surgical procedure

All the 40 patients underwent retrosigmoid craniotomy, with 22 individuals (55%) diagnosed with preoperative hydrocephalus (HCP). Among these, 12 patients (30%) had previously undergone shunting. During the intraoperative phase, Frazier's external ventricular drain (EVD) was inserted in 18 cases, representing 45% of the total procedures. Postoperatively, only 3 patients (approximately 7.7%) required shunting, highlighting the prevalence of hydrocephalus and the surgical interventions related to its management Table 5.

Table 2

Clinical finding at presentation of study population between September 1, 2023, till October 31, 2024. (n = 40).

variables	frequency	percent
Headache	38	95%
Loss of Balance	33	82.50%
Loss of Hearing	29	72.50%
Tinnitus	22	55.00%
Vertigo	21	52.50%
Nausea & Vomiting	16	40%
Facial Numbness	13	32.50%
Facial Weakness	8	20%
Body Weakness	5	12.50%
Choking Episode	11	27.50%
Visual Deterioration	13	32.50%
Urinary Incontinence	1	2.50%
Dysarthria(voice change)	4	10%
Chronic medical ilness (HTN)	5	12.50%

Moreover, there was a significant positive correlation between preoperative HCP and preoperative shunting (rho = 0.592, p = .000), indicating a strong relationship between these two preoperative factors, which is statistically significant at the 0.01 level.
Among the 40 patients, the extent of tumor resection revealed that 47.5% (19 patients) achieved gross total resection (GTR), while 17.5% (7 patients) had near-total resection (NTR). Additionally, 32.5% (13 patients) underwent subtotal resection (STR) Table 6. It is important to note that one patient was excluded from the analysis due to the abandonment of surgery twice, which occurred because of intraoperative brain swelling following craniotomy and durotomy.

The duration of surgery varied widely, ranging from a minimum of 3 hours to a maximum of 14 hours, with an average duration of 6 hours and 25 minutes. Estimated blood loss during the procedures also showed considerable variation, from 200 ml to 4500 ml. The mean duration for Frazier's external ventricular drain (EVD) was 5 days, with a range of 2 to 8 days.

Table 3

cranial nerves palsy comparsion , Preoperative&Postoperative (n = 40).

	Frequency(percent)	
Cranial nerve palsy	Preoperative	Postoperative
CNII	11(27.5%)	0(0%)
CNV	10(25%)	16(40.0%)
CNVI	2(5%)	8(20.0%)
CNVII	11(27.5%)	37(92.5%)
CNVIII	27(67.5%)	32(80.0%)
CNIX	29(72.5%)	30(75.0%)
CNX	27(67.5%)	29(72.5%)
CNXII	1(2.5%)	2(5.0%)

Tumor pathology

The biopsy analysis of 40 patients showed that 39 valid biopsies were performed, with one case missing due to an abandoned surgery. Among these valid cases, vestibular schwannomas accounted for 51.3% (20 cases), while meningiomas represented 35.9% (14 cases). Hemangioblastomas and epidermoid cysts each made up 5.1% (2 cases), and trigeminal schwannomas constituted 2.6% (1 case). Cumulatively, vestibular schwannomas and meningiomas together comprised over 87% of the biopsies analyzed Table 7. The distribution of meningioma subtypes among a total of 13 cases revealed that the most prevalent subtype was

meningiothelial, accounting for 61.5% of the cases with 8 occurrences. This was followed by the transitional subtype, which comprised 30.8% of the total with 4 cases. The fibroblastic subtype was the least common, representing 7.7% with just 1 case Table 8.

Table 4

Facial nerve palsy Grading using

House-Brackmann grading system

	Frequency(Percent)	
Grade	Preoperative	Postoperative
Grade I	29(72.5%)	3(7.5%)
Grade II	5(12.5%)	4(10%)
Grade III	3(7.5%)	7(17.5%)
Grade IV	2(5%)	14(35%)
Grade V	1(2.5%)	10(25%)
Grade VI	0(0%)	2(5%)
Total	40(100%)	40(100%)

Table 5

status of HCP

Variables	Frequency	Percent
preop HCP	22	55%
Preop shunted	12	30%
Frazier's EVD insertion(intraop)	18	45%
postop shunted	3	7.70%

Table 6

Extent of tumor resection (n=40)

Extent of tumor resection			
	Frequency	Percent	Valid Percent
GTR	19	47.5	48.7
NTR	7	17.5	17.9
STR	13	32.5	33.3
Total	39	97.5	100
Missing System	1	2.5	
Total	40	100	

Note: Missing System, is for 1 patient, surgery was abandonded twice due to intraop brain swelling after craniotomy and durotomy only

Table 7

Biopsy proven Tumor types.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Vestibular Schwannoma	20	50	51.3	51.3
	Meningioma	14	35	35.9	87.2
	Hemangioblastoma	2	5	5.1	92.3
	Epidermoid cyst	2	5	5.1	97.4
	Trigeminal schwannoma	1	2.5	2.6	100
	Total	39	97.5	100	
Missing	System	1	2.5		
Total		40	100		

Note: Missing System, is for 1 patient, surgery was abandonded twice due to intraop brain swelling after craniotomy and durotomy only (biopsy was not taken).

Table 8

Meningioma subtypes		
	Frequency	Percent
Meningiothelial	8	61.5
Transitional	4	30.8
Fibroblastic	1	7.7
Total	13	100

Postoperative complications

Motor weakness was observed in 12.5% of cases, followed by tumor bed intracerebral hemorrhage in 10%. Other complications included hospital-acquired pneumonia, septic shock, and keratitis, each affecting 7.5% of patients. Additionally, complications such as brainstem infarction, posterior fossa acute epidural hematoma, cerebrospinal fluid leaks, upper gastrointestinal bleeding, and antibiotic-associated diarrhea impacted 5% of patients. Less common complications, including meningitis, deep surgical site infection, seizures, pulmonary thromboembolism, cerebral venous sinus thrombosis, and pneumothorax, were reported in 2.5% of cases Table 9.Within one month post-surgery, 2 out of 40 patients (5.0%) died, while 38 patients (95.0%) survived. After three months, the mortality increased to 4 patients (10.0%), with 36 patients (90.0%) still alive.Regarding reoperations, 4 out of 40 patients (10.0%) underwent reoperation, while 36 patients (90.0%) did not.

Table 9

Early postoperative complications (n=40)

Postoperative complications	Frequency	Percent
Motor weakness	5	12.5

Tumor bed ICH	4	10
HAP	3	7.5
Septic shock	3	7.5
Keratitis	3	7.5
Brainstem infarction	2	5
Posterior fossa AEDH	2	5
CSF leak	2	5
UGI bleeding	2	5
Antibiotic associated Diarrhoea	2	5
Meningitis	1	2.5
Deep surgical site infection	1	2.5
Seizure	1	2.5
Pulmonary thromboembolism (PTE)	1	2.5
Cerebral venous sinus thrombosis	1	2.5
Pneumothorax	1	2.5

Short-term functional outcomes as measured by the Glasgow Outcome Scale Extended (GOSE)

The functional outcomes of 40 patients after surgery at 3month, 4 patients (10%) were classified as dead, while 3 (7.5%) experienced lower severe disability and 5 (12.5%) had lower moderate disability. Additionally, 2 patients (5%) were categorized with upper moderate disability. The majority, 24 patients (60%), achieved lower good recovery, and 2 patients (5%) reached upper good recovery Table 10. This distribution illustrates a predominance of favorable outcomes, with 65% of patients falling into the good recovery categories. Patients typically began ambulating between 2 and 44 days post-surgery, with an average of around 3 days. Postoperative hospital stays varied from 3 to 53 days, and the postoperative Karnofsky Performance Status (KPS) scores ranged from 0 to 90.

In a study of 40 patients, several complications were found to significantly impact short-term functional outcomes as measured by the Glasgow Outcome Scale Extended (GOSE). Motor weakness ($p = 0.015$), tumor bed intracranial hemorrhage (ICH) ($p = 0.022$), hospital-acquired pneumonia (HAP) ($p = 0.015$), and septic shock ($p = 0.002$) were associated with poorer outcomes, with no patients achieving upper good recovery (GOSE 7 or 8) in these groups. Additionally, posterior fossa acute epidural hematoma (AEDH) and antibiotic-associated diarrhea both showed significant associations ($p = 0.035$) Table 11. These findings underscore the detrimental effects of these complications on functional recovery in patients.

Table 10

functional outcomes at 3month (n=40)

GOS-E	Frequency	Percent
Dead	4	10

Lower Severe Disability	3	7.5
Lower Moderate Disability	5	12.5
Upper Moderate Disability	2	5
Lower Good Recovery	24	60
Upper Good recovery	2	5
Total	40	100

Overall Patient Quality of life

Preoperatively, the mean scores for various health dimensions were generally low, with physical function at 58.50 (SD 30.47) and pain at 63.81 (SD 20.66), both demonstrating strong internal consistency (Cronbach's Alpha between 0.835 and 0.870). Postoperatively, significant improvements were observed in all areas, with physical function rising to 64.17 (SD 36.60) and pain increasing to 81.60 (SD 20.95). Reliability also improved, with Cronbach's Alpha values ranging from 0.886 to 0.913, indicating enhanced consistency across measures Table 12. These findings suggest notable enhancements in patients' perceived health and well-being following surgery.

Regarding quality of life ratings, preoperatively, 13 out of 40 respondents (32.5%) rated their quality of life as good, while 27 (67.5%) rated it as poor, indicating a predominantly negative perception. Postoperatively, among 36 respondents, 27 (67.5%) rated their quality of life as good, while 9 (22.5%) rated it as poor, marking a significant improvement, with 75.0% reporting good quality of life. The four missing responses were due to deaths and were excluded, maintaining a cumulative total of 100.0%.

Overall, out of 36 respondents, 16 (40.0%) reported feeling better post-surgery, while 19 (47.5%) felt their quality of life remained the same, and only 1 respondent (2.5%) indicated a worse quality of life. This reflects a positive trend, with 44.4% valid percent of respondents feeling better after surgery. The cumulative percentage remains at 100.0%.

The crosstabulation of the Glasgow Outcome Scale-Extended (GOS-E) and Overall Quality of Life provides valuable insights into the relationship between recovery outcomes and patients' perceptions of their quality of life. The analysis includes 36 cases of living patients and reveals distinct patterns: among those classified as "Lower Good Recovery," 14 rated their quality of life as "Better," while only one rated it as "Worse." In contrast, individuals with "Lower Severe Disability" predominantly reported their quality of life as "Same," with no positive ratings. This distribution suggests that improved recovery outcomes are linked to a greater likelihood of reporting better quality of life. However, the Fisher's Exact Test yielded a p-value of .266, indicating that there is no statistically significant relationship between GOS-E categories and Overall Quality of Life ratings.

Overall Patient Satisfaction

Out of the 40 patients, 4 had passed away and 3 were severely disabled. For the latter, the PSQ-18 questionnaire was administered to their family members. The remaining questionnaires were

completed by the patients themselves. This approach aims to provide a comprehensive assessment of healthcare service satisfaction.

General satisfaction among patients scored a mean of 4.06 (SD 0.94), with technical quality slightly higher at 4.16 (SD 0.49). Interpersonal manner received the highest rating at 4.54 (SD 0.57), followed by communication at 4.04 (SD 0.63). The financial aspect scored lower at 3.03 (SD 0.91), and time spent with the doctor was rated at 3.70 (SD 0.83). Accessibility and convenience received a score of 3.79 (SD 0.78), resulting in an overall satisfaction score of 3.90 (SD 0.46). Cronbach's Alpha values indicated moderate reliability across the measures, ranging from 0.718 to 0.824 Table 13.

In terms of overall patient satisfaction ratings, out of 40 respondents, 12 (30.0%) rated their satisfaction as low, while 28 (70.0%) reported high satisfaction. This results in a cumulative total of 100.0%, demonstrating that a significant majority of patients expressed high satisfaction with their experience.

Table 11

Relationship Between Complications and Short-Term Functional Outcomes as Measured by the Glasgow Outcome Scale Extended (GOSE) (n=40)

Complications		1	2	3	4	5	6	7	8	P value
Motor weakness	Yes	2	2	0	0	0	0	1	0	0.015
	No	2	0	1	0	5	2	23	2	
Tumor bed ICH	Yes	3	0	0	0	0	0	1	0	0.022
	No	1	0	3	0	5	2	23	2	
HAP	Yes	2	0	1	0	0	0	0	0	0.015
	No	4	0	3	0	5	2	24	2	
Septic shock	Yes	3	0	0	0	0	0	0	0	0.002
	No	1	0	3	0	5	2	24	2	
Keratitis	Yes	0	0	0	0	0	0	3	0	1
	No	4	0	3	0	5	2	21	2	
Brainstem infarction	Yes	1	0	1	0	0	0	0	0	0.109
	No	3	0	2	0	5	2	24	2	
Posterior fossa AEDH	Yes	2	0	0	0	0	0	0	0	0.035
	No	2	0	3	0	5	2	24	2	
CSF leak	Yes	0	0	0	0	0	0	1	0	0.277
	No	4	0	3	0	5	1	23	2	
UGI bleeding	Yes	1	0	1	0	0	0	0	0	0.109
	No	3	0	2	0	5	2	24	2	
Antibiotic associated Diarrhoea	Yes	2	0	0	0	0	0	0	0	0.035
	No	2	0	3	0	5	2	24	2	

Meningitis	Yes	0	0	0	0	0	1	0	0	0.1
	No	4	0	3	0	5	1	24	2	
Deep surgical site infection	Yes	0	0	0	0	0	1	0	0	0.1
	No	4	0	3	0	5	1	24	2	
Seizure	Yes	0	0	0	0	1	0	0	0	0.4
	No	4	0	3	0	4	2	24	2	
Pulmonary thromboembolism (PTE)	Yes	1	0	0	0	0	0	0	0	0.275
	No	3	0	3	0	5	2	24	2	
Cerebral venous sinus thrombosis	Yes	1	0	0	0	0	0	0	0	0.277
	No	3	0	3	0	5	2	24	2	
Pneumothorax	Yes	1	0	0	0	0	0	0	0	0.277
	No	3	0	3	0	5	2	24	2	

Note : P value is from Fisher's Exact Test, and the catagorical number 1-8 represents, Dead=1 Vegetative State =2 Lower Severe Disability =3 Upper Severe Disability=4 Lower Moderate Disability=5 Upper Moderate Disability =6 Lower Good Recovery =7 Upper Good recovery =8

Table 12

Reliability, Central Tendency, and Variability of Scales of Patient Reported Outcome measure(PROM,SF36), QoL.

	Preoperative		Postoperative	
Variables	Mean(Std. Deviation)	Cronbach's Alpha	Mean(Std. Deviation	Cronbach's Alpha
Physical Function	58.50(30.47)	0.844	64.17(36.60)	0.886
Role Limitation due to Physical Health	21.25(39.45)	0.841	49.31(48.36)	0.913
Role Limitation due to Emotional Problems	25.00(41.17)	0.835	58.33(48.06)	0.901
Energy Fatigue	53.13(15.80)	0.856	65.14(20.68)	0.905
Emotional Well Being	55.90(18.69)	0.854	72.11(18.38)	0.906
Social Function	53.44(24.68)	0.847	65.63(29.94)	0.895
Pain	63.81(20.66)	0.87	81.60(20.95)	0.903
General Health	51.00(16.69)	0.87	69.03(22.83)	0.907

The crosstabulation of the Glasgow Outcome Scale-Extended (GOS-E) and Overall Patient Satisfaction Rating provides insights into the relationship between patient recovery outcomes and their satisfaction levels. The data indicates a notable distribution, with a total of 40 cases analyzed. Patients categorized under "Lower Good Recovery" reported the highest satisfaction,

with 18 out of 24 rating their experience as high. Conversely, individuals with "Lower Severe Disability" and "Upper Moderate Disability" exhibited more mixed ratings, highlighting the variability in patient satisfaction based on recovery status. The application of Fisher's Exact Test revealed a p-value of .029, suggesting a significant association between the GOS-E categories and overall patient satisfaction ratings Figure 1. This indicates that as recovery outcomes improve, patient satisfaction tends to increase, reinforcing the importance of recovery status in shaping patient perceptions of care.

Among patients with postoperative CN VII palsy, 12 reported "Low" satisfaction, while 25 rated their satisfaction as "High." In contrast, all three patients without CN VII palsy rated their satisfaction as "High." Overall, 28 out of 40 respondents (70%) reported high satisfaction. Chi-square tests revealed a significant association between postoperative CN VII palsy and overall patient satisfaction, with p-values of < 0.001 for CN VII palsy and 0.011 for patient satisfaction. Despite this significance, the effect size is small, indicating that patients with CN VII palsy tend to report lower satisfaction levels compared to those without the condition Figure 2.

Table 13

Patients' satisfaction , using PSQ18

Variables	Mean(Std. Deviation)	Cronbach's Alpha
General Satisfaction	4.06(0.94)	0.78
Technical Quality	4.16(0.49)	0.775
Interpersonal Manner	4.54(0.57)	0.74
Communication	4.04(0.63)	0.77
Financial Aspect	3.038(0.91)	0.824
Time Spent with Doctor	3.70(0.83)	0.738
Accessibility and Convenience	3.79(0.78)	0.769
Overall Satisfaction	3.90(0.46)	0.718

Patients reporting a "Better" quality of life generally have high satisfaction ratings, with 13 out of 16 in the "High" category. Those perceiving their quality of life as the same show a balanced distribution, with 7 low and 12 high ratings. The "Worse" category has very low satisfaction, with only one high rating. Out of 36 responses, 26 rated their satisfaction as "High," indicating a link between improved quality of life and higher satisfaction. Additionally, the Chi-Square statistic is 1.813 ($df = 2$) with a p-value of 0.404, suggesting no significant association Figure 3.

In summary, overall patient satisfaction scored a mean of 4.06 (SD 0.94), with the highest rating in interpersonal manner at 4.54 (SD 0.57) and the lowest in financial aspects at 3.03 (SD 0.91). Among 40 respondents, 12 (30%) rated their satisfaction as low, while 28 (70%) rated it high. Analysis of the Glasgow Outcome Scale-Extended (GOS-E) revealed that patients in the "Lower

Good Recovery" category had the highest satisfaction, with a significant association ($p = 0.029$) between GOS-E outcomes and patient satisfaction. For those with postoperative CN VII palsy, 12 reported low satisfaction, while all without it rated high; Chi-Square tests showed significant associations ($p < 0.001$), although the effect size was small. Additionally, patients with a "Better" quality of life had high satisfaction ratings, while those in the "Worse" category reported very low satisfaction, but no significant association was found ($p = 0.404$).

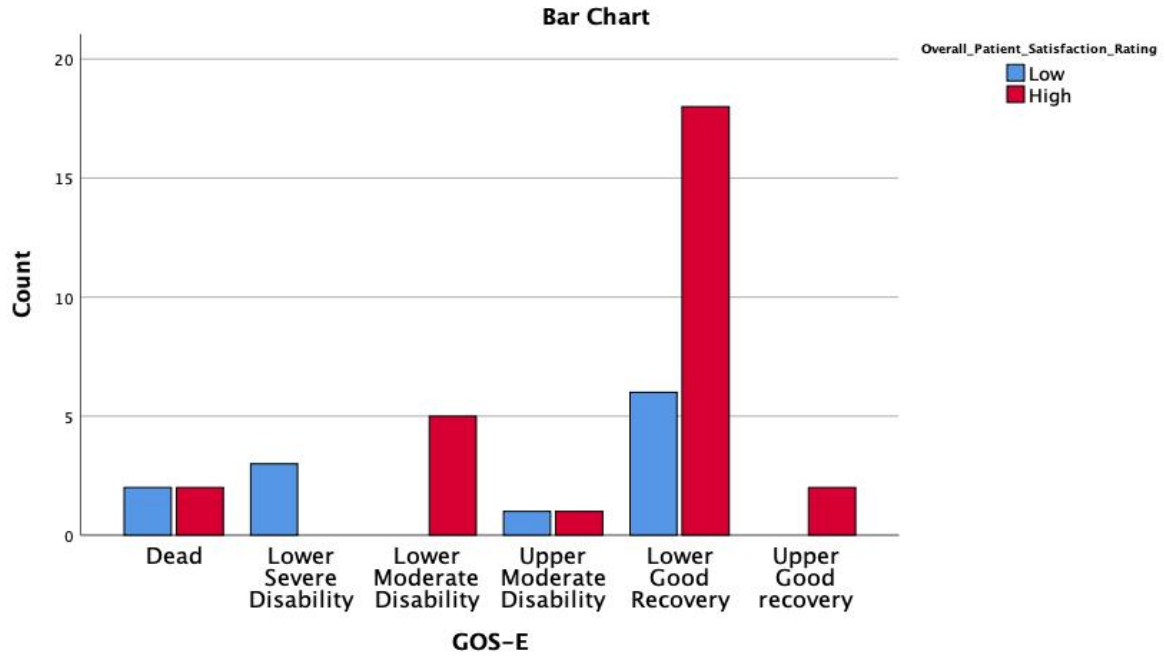


Figure 1 Glasgow Outcome Scale-Extended (GOS-E) * Overall Patient Satisfaction

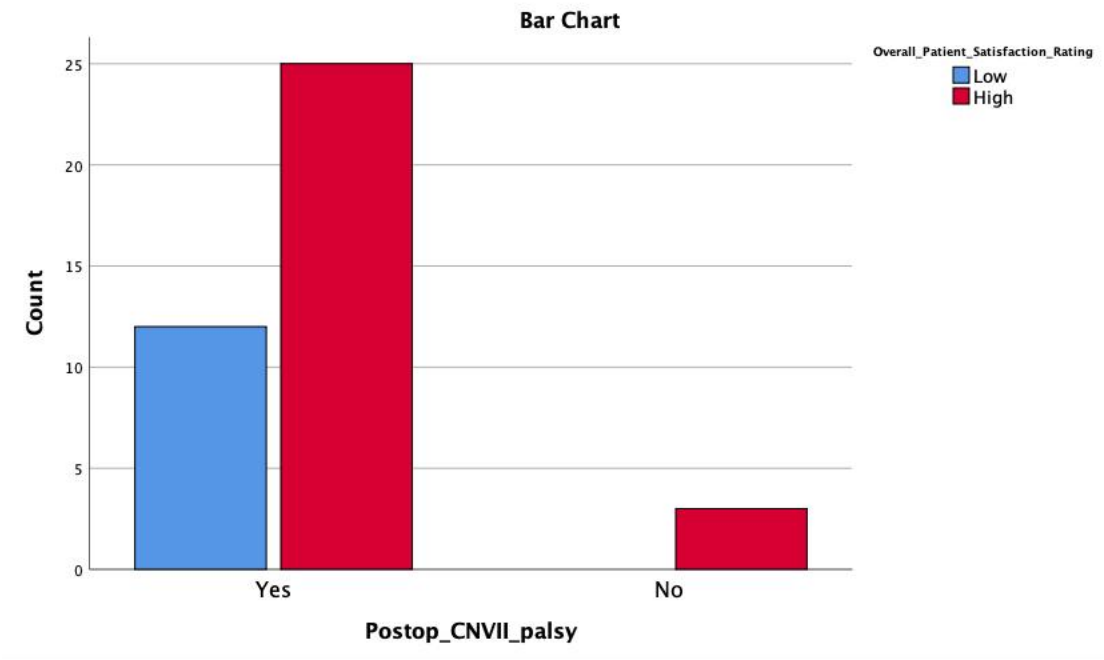


Figure 2 Postop CNVII palsy * Overall Patient Satisfaction Rating

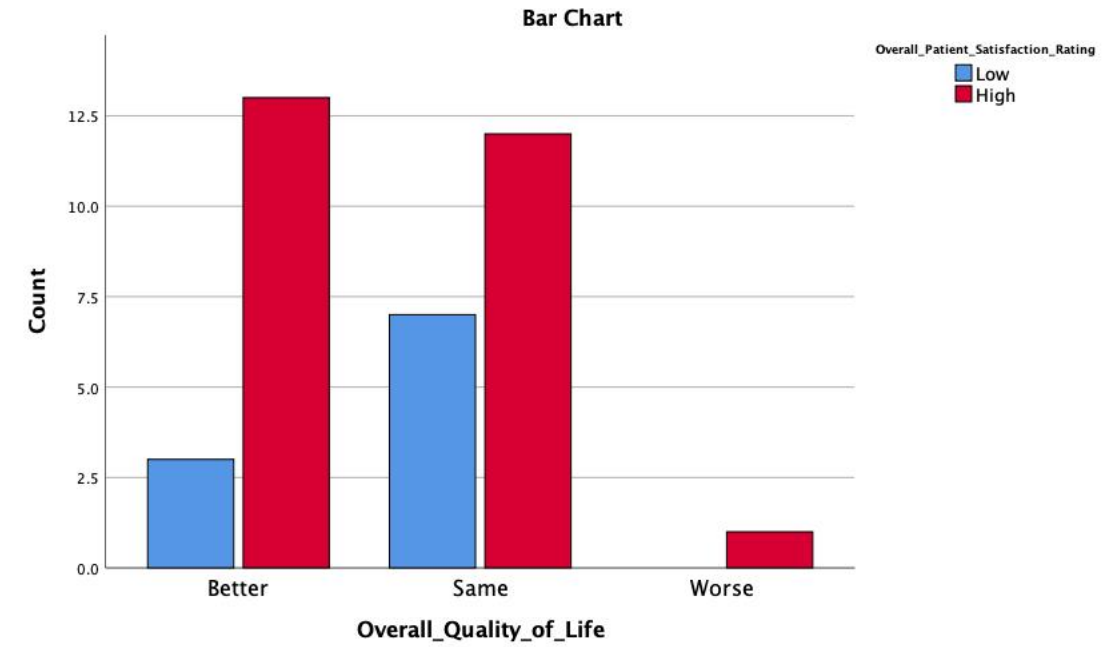


Figure 3 Overall Quality of life * Overall Patient Satisfaction Rating

DISCUSSION

This study examined the demographic profile of 40 surgical patients, revealing a mean age of 40.80 years, with a slight female predominance (52.5%). The largest age group was 31-40 years (37.5%), contrasting with older age groups (51-70 years), which comprised only 12.5% and 5%, respectively. These findings indicate a trend toward a younger surgical population compared to Yesehak et al. (11) earlier study, which reported a mean age of 36.64 years and a higher male representation. In contrast, Elina Reponen et al. (12) larger study noted a mean age of 56.4 years and a majority female demographic (62%).

The clinical presentations observed in our study revealed a high prevalence of symptoms characteristic of cerebellopontine angle (CPA) tumors, with headache (95%), loss of balance (82.5%), and hearing loss (72.5%) being the most reported. These findings align with existing literature, including Yesehak et al. (11) study, which also highlighted significant symptoms such as hearing loss and balance issues, underscoring the consistent nature of these presentations across various populations. The involvement of cranial nerve VIII (CNVIII) was particularly notable in our cohort, with preoperative involvement observed in 67.5% of patients, increasing to 80% postoperatively. This pattern is corroborated by Lazard et al. (10), who reported significant cranial nerve dysfunction in CPA tumor patients. Moreover, the dramatic rise in cranial nerve VII (CNVII) involvement post-surgery (from 27.5% to 92.5%) reflects the pronounced impact of surgical intervention on facial nerve function, echoing findings by Rahman et al. (5) regarding the risks associated with resection of these tumors.
The chronicity of symptoms, with an average duration of 25.4 months, highlights the need for timely surgical intervention, aligning with Wadd et al.'s observations of prolonged symptom duration leading to substantial neurological deficits. Preoperative assessments indicated a relatively high level of consciousness, as demonstrated by Glasgow Coma Scale (GCS) scores ranging from 13 to 15 and a median Karnofsky Performance Scale (KPS) score of 80. This reflects the overall functional status of our patients prior to surgery, which is consistent with findings from Reponen regarding the importance of baseline evaluations in predicting postoperative outcomes. The predominance of larger tumors in our study (72.5% >4 cm) is particularly concerning, as larger tumors are often linked to more severe symptoms and complex surgical challenges, a concern noted by Kiyofuji et al. (13) Ultimately, our findings emphasize the critical need for early diagnosis and intervention in CPA tumor patients, as this can significantly enhance surgical outcomes and improve overall quality of life.

In our study, all 40 patients underwent retrosigmoid craniotomy, with a notable 55% diagnosed with preoperative hydrocephalus (HCP). This prevalence underscores the challenges associated with CPA tumors, as HCP can significantly complicate surgical management and impact patient outcomes. Among those with HCP, 30% had previously undergone shunting, indicating a history of severe symptomatic presentations that required prior intervention. The intraoperative use of Frazier's external ventricular drain (EVD) in 45% of cases further illustrates the proactive approach to managing intracranial pressure during surgery, a practice supported by the literature, including studies by Lazard et al. (10) and Wadd et al. (4), which emphasize the importance of addressing HCP to facilitate optimal surgical conditions. Remarkably, only 7.7% of patients required shunting postoperatively, suggesting that the strategies employed during surgery effectively alleviated the need for additional interventions.

Moreover, our findings revealed a significant positive correlation between preoperative HCP and prior shunting (rho = 0.592, p = .000), indicating a robust relationship that underscores the necessity for careful preoperative evaluation. This correlation is crucial for surgical planning, as highlighted by Rahman et al., who discussed the implications of HCP in surgical outcomes. The extent of tumor resection in our cohort was promising, with 47.5% achieving gross total resection (GTR) and 17.5% attaining near-total resection (NTR), while 32.5% underwent subtotal resection (STR). It is noteworthy that one patient was excluded due to intraoperative complications, including brain swelling, which emphasizes the complexities involved in such surgeries, a challenge echoed in various studies, including those by Samii and Gerganov (2). The duration of surgeries varied significantly, ranging from 3 to 14 hours, with an average of 6 hours and 25 minutes, and estimated blood loss varied from 200 ml to 4500 ml, indicating the demanding nature of these procedures. The average duration for EVD placement was 5 days (range 2 to 8 days), which reflects the need for careful monitoring and management of patients postoperatively. Overall, these findings highlight the critical role of comprehensive preoperative assessment and intraoperative management in improving surgical outcomes for patients with CPA tumors and associated hydrocephalus.

The biopsy analysis of the 40 patients revealed that 39 valid biopsies were performed, with vestibular schwannomas making up the majority at 51.3% (20 cases), consistent with previous studies, including those by Lak and Khan (1), which identify these tumors as the most prevalent in the cerebellopontine angle (CPA). Meningiomas represented 35.9% (14 cases), reinforcing their significant presence in this anatomical region. Together, vestibular schwannomas and meningiomas comprised over 87% of the tumors analyzed, reflecting trends noted in the literature, such as Wadd et al (4). Among the meningioma cases, the meningiothelial subtype was the most common at 61.5% (8 cases), aligning with findings from Samii and Gerganov (2), while the transitional subtype accounted for 30.8% (4 cases) and the fibroblastic subtype was least common at 7.7% (1 case). Understanding the distribution of these tumor types is critical, as it can influence treatment strategies and prognostic outcomes, as emphasized by Rahman et al (14). Thus, these findings underscore the importance of precise diagnostic processes in managing CPA tumors, as their histopathological characteristics significantly impact clinical decision-making and patient care.

In this cohort, postoperative complications included motor weakness in 12.5% of cases and tumor bed intracerebral hemorrhage in 10%. Other significant complications, such as hospital-acquired pneumonia, septic shock, and keratitis, each affected 7.5% of patients, mirroring findings from Yesehaka et al (11). and Lazard et al (10). Severe complications, including brainstem infarction and cerebrospinal fluid leaks, occurred in 5% of patients, consistent with Wadd et al.'s (4) findings. Mortality rates were concerning, with 5.0% of patients dying within one month and 10.0% after three months, comparable to Rahman et al.'s (14) observations. Additionally, 10.0% of patients required reoperations, highlighting the complexities of surgical management. These findings underscore the necessity for vigilant postoperative monitoring and management strategies in CPA tumor surgeries, as reflected in the referenced literature.

Three months post-surgery, 10% of the 40 patients classified as deceased, while 60% achieved lower good recovery, reflecting a predominance of favorable outcomes for 65% of the cohort, This aligns with findings from Yesehaka et al. (11) and Wadd et al. (4), where a significant

proportion of patients also reported favorable functional outcomes following CPA tumor surgeries. Patients typically began ambulating between 2 and 44 days, averaging around 3 days, and postoperative Karnofsky Performance Status (KPS) scores ranged from 0 to 90, highlighting variability in recovery, similar to findings by Rahman et al (14). regarding prolonged recovery times.
Significantly, complications such as motor weakness ($p = 0.015$), tumor bed intracranial hemorrhage (ICH) ($p = 0.022$), hospital-acquired pneumonia (HAP) ($p = 0.015$), and septic shock ($p = 0.002$) were associated with poorer functional outcomes, aligning with the results reported by Lazard et al (10). and Kiyofuji et al (13)., which noted similar adverse effects of complications on recovery. Notably, no patients in these groups achieved upper good recovery (GOSE 7 or 8). Additionally, posterior fossa acute epidural hematoma and antibiotic-associated diarrhea were also significantly linked to poorer outcomes ($p = 0.035$), underscoring the critical need for effective management of postoperative complications to optimize functional recovery in patients undergoing surgeries for cerebellopontine angle tumors.

Preoperative assessments of health dimensions among the 40 patients indicated low mean scores, with physical function averaging 58.50 (SD 30.47) and pain at 63.81 (SD 20.66). These scores demonstrated strong internal consistency, as shown by Cronbach's Alpha values between 0.835 and 0.870. Postoperatively, patients exhibited significant improvements across all dimensions, with physical function increasing to 64.17 (SD 36.60) and pain rising to 81.60 (SD 20.95). This improvement in reliability, reflected in Cronbach's Alpha values of 0.886 to 0.913, indicates enhanced consistency in health perceptions. Similar findings are reported by Rahman et al (14). and Lazard et al (10)., which highlighted the positive effects of surgical interventions on patients' health-related quality of life (HRQoL).

Before surgery, 32.5% of respondents rated their quality of life as good, contrasting sharply with the postoperative evaluation, where 67.5% rated it positively. This notable shift, wherein 40% of respondents felt better post-surgery, aligns with the findings of Elina Reponen (12), who emphasized that patient satisfaction significantly influences perceived quality of life after surgical interventions. However, the analysis of the Glasgow Outcome Scale-Extended (GOS-E) in relation to overall quality of life revealed that while improved recovery outcomes correlated with positive life ratings, statistical significance was absent ($p = .266$). This indicates that while recovery and quality of life are interconnected, other factors may also influence patients' perceptions. The lack of significant correlation is echoed in studies by Samii and Gerganov (2), suggesting that comprehensive evaluations of patient outcomes must consider both clinical and subjective dimensions of recovery.

Out of the 40 patients assessed post-surgery, 4 had unfortunately passed away, and 3 experienced severe disabilities. To capture a comprehensive view of healthcare service satisfaction, the PSQ-18 questionnaire was administered to the families of those who were severely disabled, while the remaining questionnaires were filled out by the patients themselves. The overall patient satisfaction score averaged 4.06 (SD 0.94), with technical quality slightly higher at 4.16 (SD 0.49). The interpersonal manner of healthcare providers received the highest rating (4.54, SD 0.57), which aligns with findings from Rahman et al (14)., who emphasized the importance of provider-patient interactions in surgical settings. However, aspects like financial considerations (3.03, SD 0.91) and time spent with doctors (3.70, SD 0.83) were rated lower, indicating areas

that may need improvement. Accessibility and convenience received a moderate score of 3.79 (SD 0.78), culminating in an overall satisfaction score of 3.90 (SD 0.46). The internal reliability of these measures was moderate, with Cronbach's Alpha values ranging from 0.718 to 0.824, consistent with standards established by previous studies.

In evaluating the relationship between recovery outcomes and patient satisfaction, significant insights emerged from the crosstabulation of the Glasgow Outcome Scale-Extended (GOS-E) and overall satisfaction ratings. Among those categorized as having "Lower Good Recovery," 18 out of 24 rated their experience as high, indicating a clear trend where better recovery correlates with increased satisfaction. This finding resonates with Samii and Gerganov's (2) research, which found that surgical outcomes significantly influence patient satisfaction levels. The Fisher's Exact Test yielded a p-value of .029, affirming a significant association between GOS-E categories and satisfaction ratings, suggesting that improved recovery outcomes enhance patient perceptions of care.

Moreover, analysis of satisfaction among patients with postoperative cranial nerve VII (CN VII) palsy revealed that 12 reported low satisfaction, while 25 rated their satisfaction as high. In contrast, all three patients without CN VII palsy rated their satisfaction highly. The chi-square tests indicated a significant association between CN VII palsy and overall satisfaction ($p < 0.001$), although the effect size was small, highlighting a nuanced impact of postoperative complications on satisfaction. Additionally, patients reporting a "Better" quality of life exhibited higher satisfaction ratings, with 13 out of 16 categorizing their experience as high. Those who felt their quality of life remained the same showed a more balanced satisfaction distribution, while those perceiving their quality as "Worse" rated satisfaction very low. However, the association between quality of life and satisfaction was not statistically significant ($p = 0.404$), suggesting that while there is a tendency for higher satisfaction with improved quality of life, other factors may also play a role.

In summary, the overall patient satisfaction averaged 4.06 (SD 0.94), with interpersonal interactions rated highest (4.54, SD 0.57) and financial aspects rated lowest (3.03, SD 0.91). A majority of patients (70%) reported high satisfaction, particularly those in the "Lower Good Recovery" category, which demonstrated a significant correlation with satisfaction levels ($p = 0.029$). Postoperative CN VII palsy negatively influenced satisfaction ratings, with significant associations observed ($p < 0.001$), albeit with a small effect size. Lastly, although patients reporting a "Better" quality of life tended to have high satisfaction ratings, no significant association was found ($p = 0.404$), underscoring the complexity of factors influencing patient perceptions post-surgery.

Strengths

This study has several notable strengths, including clearly defined objectives that focus on evaluating postoperative complications, functional outcomes, quality of life, and patient satisfaction. Its prospective cohort design allows for real-time data collection, enhancing the understanding of temporal relationships. The inclusion of multiple follow-up assessments at key intervals provides a comprehensive view of recovery. Using a census sampling method minimizes selection bias, while the application of validated assessment tools (e.g., GOS-E, SF-36, PSQ-18) ensures reliable and comparable results. Conducting the study in both a public and private hospital context adds diversity and relevance to the findings.

Limitations

Despite its strengths, the study is limited by a sample size of 40, which may restrict statistical power and generalizability. The focus on just two hospitals may not capture the broader experiences of patients in different healthcare settings. Additionally, the 90-day follow-up period may not reveal long-term complications or outcomes. Potential confounding variables, such as differences in surgical expertise and postoperative care, could also influence the results. Furthermore, reliance on self-reported data for patient satisfaction introduces subjectivity, and excluding non-surgical patients limits comparative insights on outcomes.

CONCLUSION

This study provides valuable insights into the demographic and clinical profiles of patients undergoing retrosigmoid craniotomy for cerebellopontine angle tumors. The findings highlight a younger surgical population with prevalent symptoms of headache, balance loss, and hearing impairment. The significant involvement of cranial nerves, particularly postoperatively, underscores the complexities of surgical management and the necessity for careful preoperative evaluations. While most patients demonstrated favorable functional outcomes and improved quality of life post-surgery, notable complications and mortality rates highlight the inherent risks associated with these procedures.

Overall, the study emphasizes the critical importance of timely diagnosis and intervention in enhancing surgical outcomes. Despite the limitations of a small sample size and a short follow-up period, the findings reinforce the need for vigilant postoperative monitoring and the implementation of strategies to optimize patient satisfaction and recovery. Future research with larger cohorts and extended follow-up durations is essential to further understand the long-term implications of surgical interventions for CPA tumors.

Recommendations

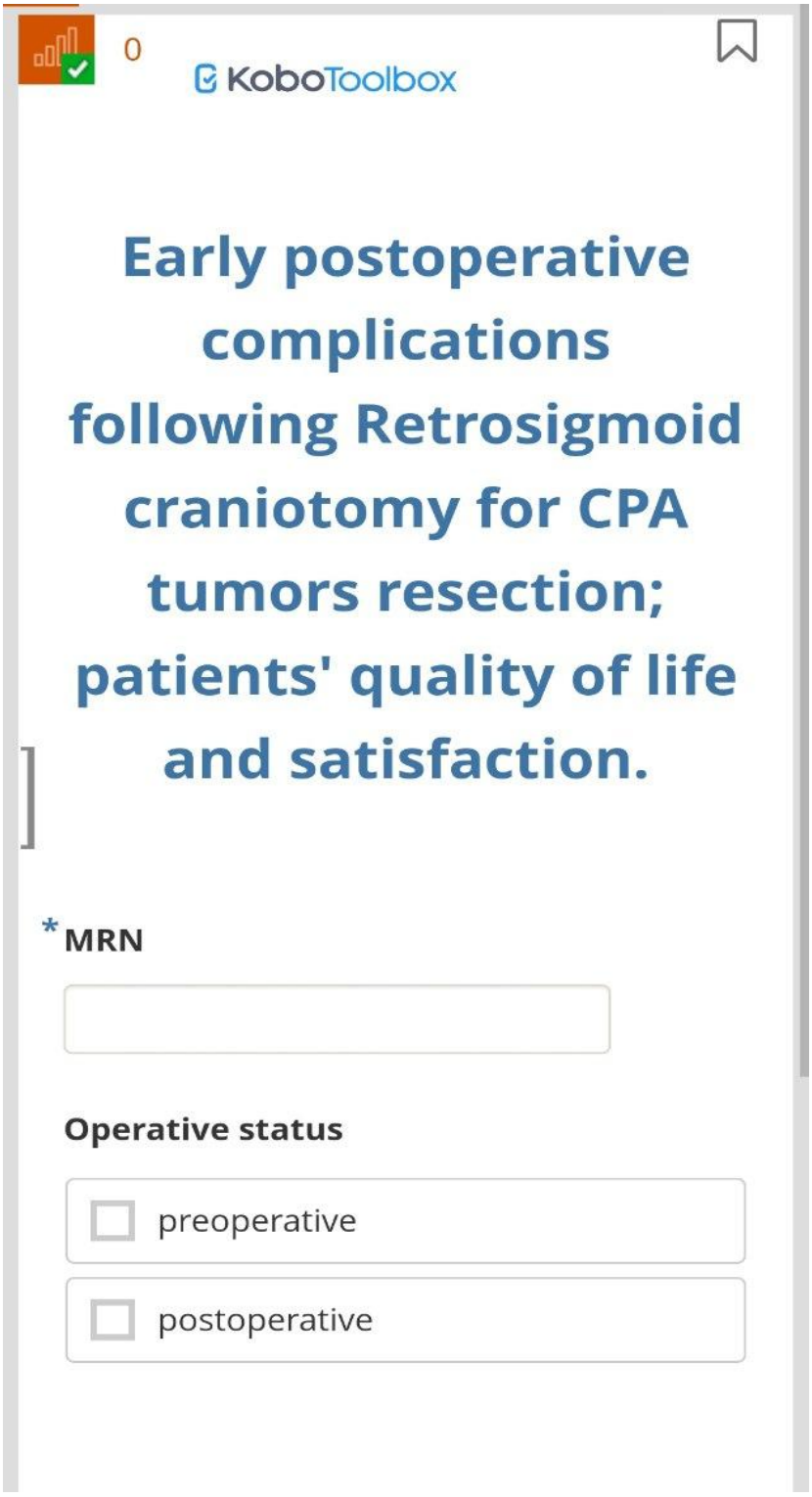
To improve surgical outcomes for cerebellopontine angle (CPA) tumors, early diagnosis and intervention should be prioritized, particularly for younger populations presenting with symptoms such as headaches, balance loss, and hearing impairment. Enhanced preoperative assessments are essential to evaluate tumor size, cranial nerve involvement, and risks of hydrocephalus, enabling better surgical planning and improved outcomes. Postoperative care should emphasize vigilant monitoring and proactive management of complications, including motor weakness, intracerebral hemorrhage, and cranial nerve palsy, to facilitate recovery and enhance patient satisfaction. Addressing financial concerns and improving healthcare accessibility, alongside prioritizing optimal recovery outcomes, are key to enhancing overall patient satisfaction. Further research with larger sample sizes and longer follow-up periods is necessary to better understand long-term outcomes and complications. Additionally, expanding studies to include diverse healthcare settings will improve the generalizability of findings and contribute to more effective CPA tumor management.

References

1. *Cerebellopontine Angle Cancer.* **Asad M. Lak; Yusuf S. Khan.** s.l. : StatPearls, 2023.
2. **Madjid Samii, Venelin M. Gerganov.** *Cerebellopontine Angle Tumors.* 2015 .
3. *Patients Satisfied with Care Report Better Quality of Life and Self-Rated Health—Cross-Sectional Findings Based on Hospital Quality Data.* **Linda Baumbach, Marc Frese, Martin Härter et al.** s.l. : Healthcare (Basel). , 2023.
4. *Surgical Outcome of Cerebellopontine Angle Tumours by Retrosigmoid Approach.* **Ijaz Hussain Wadd, K. Anwar, Habib Ullah Fatih.** s.l. : PJNS , 2016, PAKISTAN JOURNAL OF NEUROLOGICAL SURGERY, Vol. 20.
5. *Surgical Outcomes of Cerebellopontine Angle Tumors in 48 Cases.* **Rahman, M. A., Hafiz, A. M., Islam, K. T., Mitra, P. K., Mahmud, E., & Barua, K. K.** 2020, Bangladesh Journal of Neurosurgery, Vol. 9, pp. 117–220.
6. *Retrosigmoid Craniotomy for Cerebellopontine Epidermoid Cyst.* **J. Höhne, A. Brawanski, K. Schebesch.** s.l. : Thieme, 2019, Journal of Neurological Surgery Part B, Vol. 80(S 03), p. S329.
7. **Kang, .** Management of Patient with Cerebellopontine Angle Tumor. *Problem Based Learning Discussions in Neuroanesthesia and Neurocritical Care.* s.l. : SpringerLink, 2020, pp. 35–49.
8. *Retrosigmoid craniotomy for cerebellopontine angle/petroclival epidermoid cyst.* **Shaan M. Raza M.D. and Franco DeMonte M.D.** s.l. : Journal of neurosurgery, 2014, AAN neurosurgical education, Vol. 36, p. 1.
9. **Mohamad-Motaz AL MAHDI1,Joachim K. KRAUSS1,Makoto NAKAMURA1,Almuth BRANDIS2,Bujung HONG1.** *Early Ectopic Recurrence of Craniopharyngioma in the Cerebellopontine Angle.* s.l. : Turkish Neurosurgery, 2016.
10. *Early complications and symptoms of cerebellopontine angle tumor surgery: a prospective analysis.* **Diane S. Lazard • Maria Tosello • Alexis Bozorg-Grayeli • Elizabeth Vitte •Didier Bouccara • Michel Kalamarides • Olivier Sterkers.** s.l. : Springer, 2011, Eur Arch Otorhinolaryngol, Vol. 268, pp. 1575–1582.
11. *Facial nerve function and general outcome of patients operated for cerebellopontine angle tumors in Addis Ababa, Ethiopia, a retrospective study.* **Bethelehem Yesehaka, Abenezer Tirsit.** s.l. : Interdisciplinary Neurosurgery: Advanced Techniques and Case Management, 2022.
12. *Patient Satisfaction and Short-Term Outcome in Elective Cranial Neurosurgery.* **Elina Reponen, .** Helsinki : Congress of Neurological Surgeons., August 4, 2015.
13. *Endoscopic transnasal resection of the CP angle schwannoma.* **Satoshi Kiyofuji MD, Masahiro Shin MD, PhD, Kenji Kondo MD, PhD, Tsukasa Koike MD, Taichi Kin MD, PhD, and Nobuhito Saito, MD, PhD.** 2020, Neurosurg Focus Video, Vol. 13, p. video 2.
14. *Surgical Outcome of Cerebellopontine Angle Tumors: A Study of 24 Cases.* **H. Nath, K. Barua, H. Rahman, Md Shahnewaz Bari, H. Amin,.** 2014, Bangladesh Journal of Neuroscience, Vol. 30 (2), pp. 90-95.

15. *Facial nerve function and general outcome of patients operated for cerebellopontine angle tumors in Addis Ababa, Ethiopia, a retrospective study.* **Bethelehem Yesehaka, Abenezer Tirsit.** s.l. : Interdisciplinary Neurosurgery: Advanced Techniques and Case Management, 2022.

ANNEXES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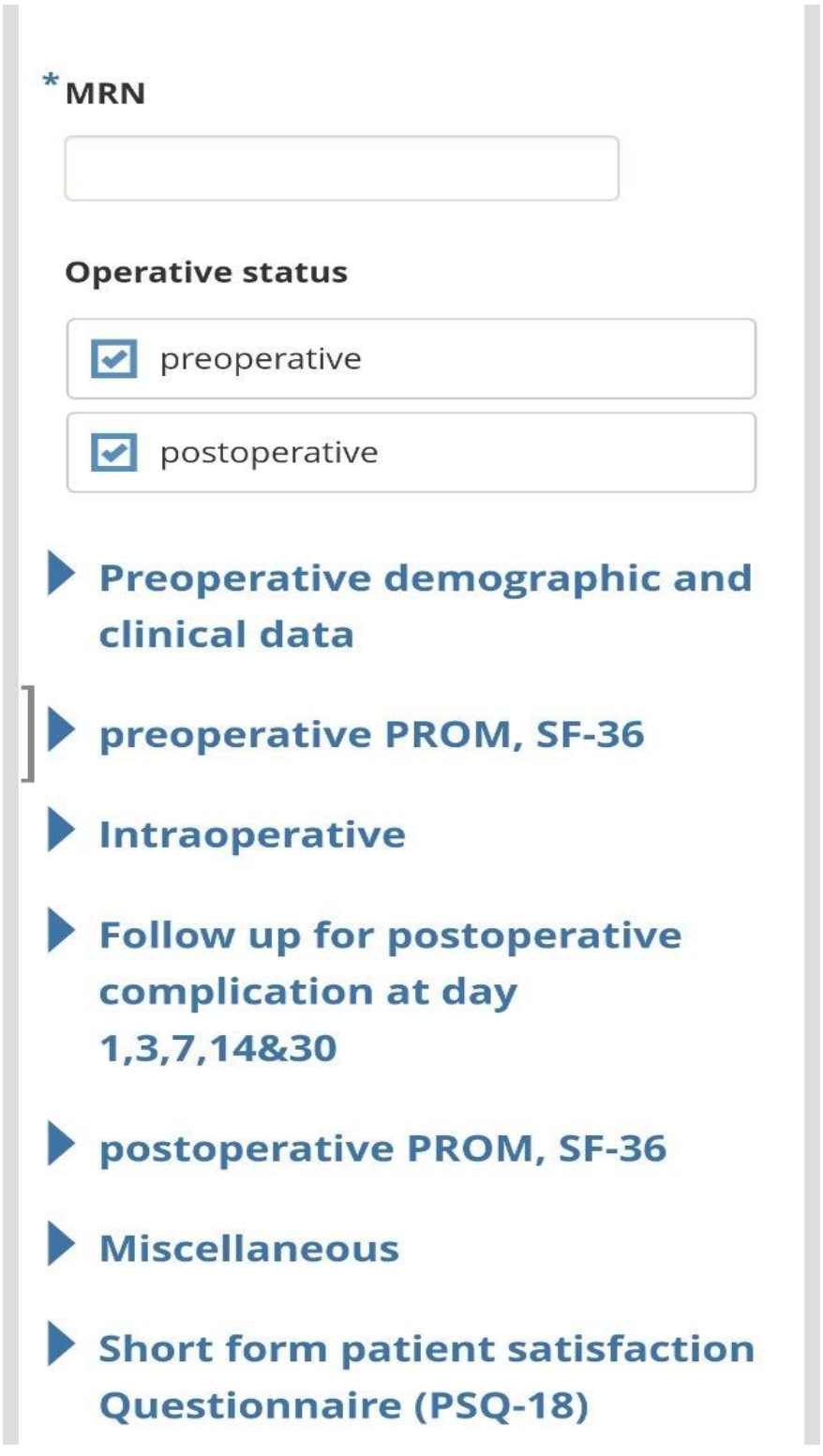
KoboToolbox
Early postoperative complications following Retrosigmoid craniotomy for CPA tumors resection; patients' quality of life and satisfaction.
* MRN
Operative status
preoperative
postoperative


*MRN
Operative status
preoperative
postoperative
Preoperative demographic and clinical data
preoperative PROM, SF-36
Intraoperative
Follow up for postoperative complication at day 1,3,7,14&30
postoperative PROM, SF-36
Miscellaneous
Short form patient satisfaction Questionnaire (PSQ-18)

Preoperative demographic and clinical data

phone number

Age

gender

- [ ] male
- [ ] female

preoperative neurologic symptoms

- [ ] headache
- [ ] nausea /or vomiting
- [ ] facial numbness
- [ ] facial weakness
- [ ] tinnitus
- [ ] vertigo

- [ ] tinnitus
- [ ] vertigo
- [ ] hearing loss
- [ ] loss of balance
- [ ] body weakness
- [ ] ABM
- [ ] none
- [x] others (specify)

others (specify)

side of symptoms(if specific)

duration of symptoms

history of chronic medical illness

- [ ] HTN
- [ ] DM
- [ ] HTN&DM
- [ ] none
- [x] other(specify)

other(specify)

preoperative KPS score

preoperative GCS score

preoperative cranial nerve palsy?

- [ ] CNV
- [x] CNVII
- [ ] CNVIII
- [ ] CNIX
- [ ] CNX
- [ ] none
- [ ] other (specify)

grade CNVII palsy using House-Brackmann grading system

side of CN palsy

- [ ] rt
- [ ] lt
- [ ] bilateral

unmentioned preop sign (deficit)

MRI tumor type

tumor volume in cm3

side of the tumor location

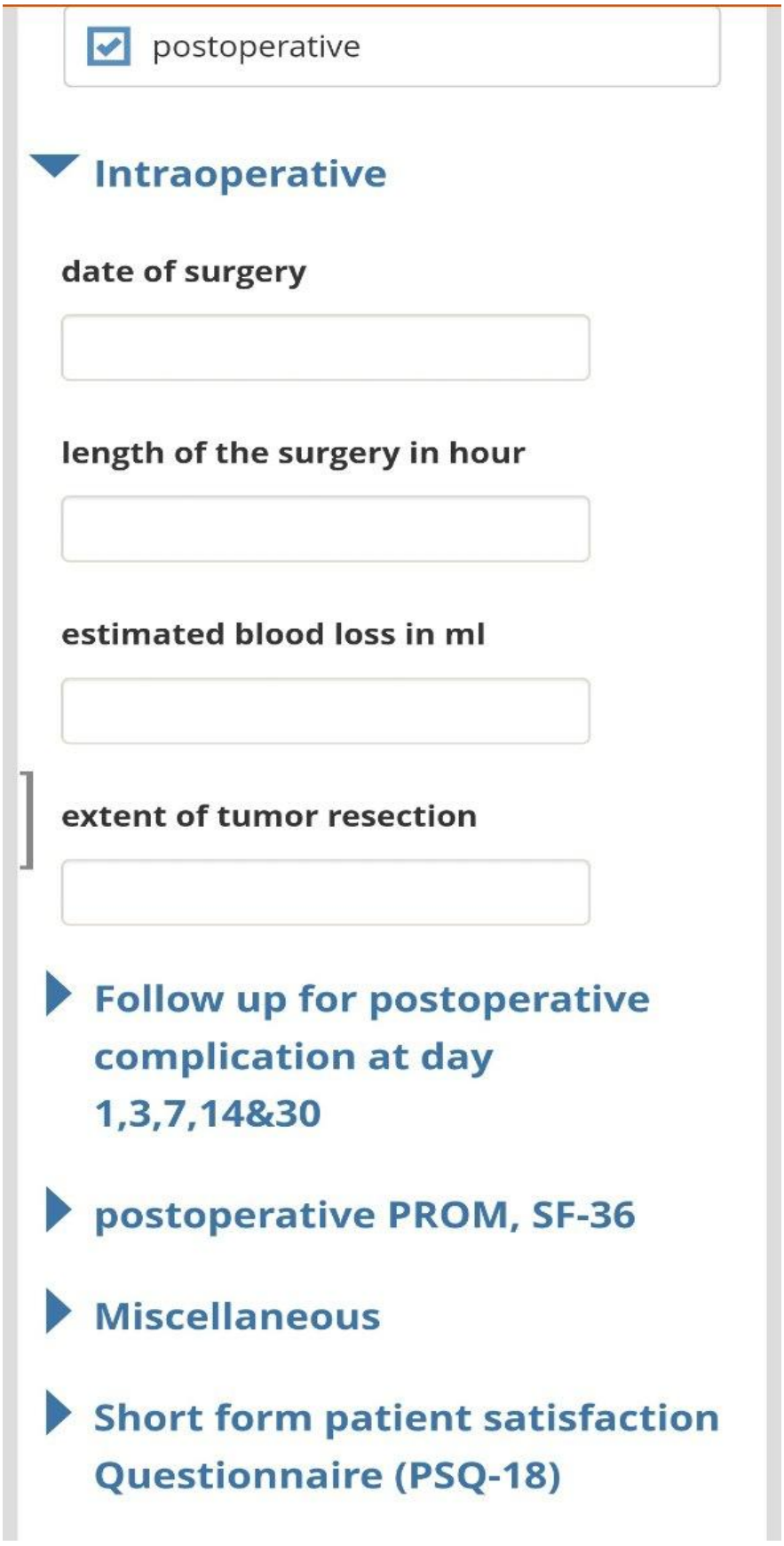
- [ ] rt CPA
- [ ] lt CPA
- [ ] bilateral CPA

is there HCP?

- [x] yes
- [ ] no

shunted before definitive surgery?

- [ ] yes
- [ ] No


postoperative
Intraoperative
date of surgery
length of the surgery in hour
estimated blood loss in ml
extent of tumor resection
Follow up for postoperative complication at day 1,3,7,14&30
postoperative PROM, SF-36
Miscellaneous
Short form patient satisfaction Questionnaire (PSQ-18)

GOS-E

- [ ] Dead
- [ ] Vegetative State
- [ ] Lower Severe Disability
- [ ] Upper Severe Disability
- [ ] Lower Moderate Disability
- [ ] Upper Moderate Disability
- [ ] Lower Good Recovery
- [ ] Upper Good recovery