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COMPLICATIONS IN NEUROSURGICAL INTERVENTIONS (BRAIN TUMOR RESECTION) IN THE AGING POPULATION (GERIATRIC CONSIDERATIONS)

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Abstract: A cross-sectional study was conducted in Iraq to evaluate complications in neurosurgical interventions, specifically brain tumour resection, in the ageing population. Were collected Data of Iraqi patients from multiple hospitals between 2021 and 2023, and the study, which included 80 patients, aimed to determine the prevalence of complications. Furthermore, this study identified KPS as a significant factor in determining the severity and quality of patient complications. Statistical analysis programmes such as SPSS, IBM, and FT were used to analyze the data and results. Out of 80 patients, 39 experienced complications, while 41 did not. The study found that the most prevalent complications were neurological deficits for six patients (7.5%), bleeding for five patients (6.25%), and headaches and pain for eight patients (10%). The mortality rate was also determined for six patients (7.5%). The findings suggest a strong association between the occurrence of complications in Iraqi patients who underwent brain tumour resection and several parameters, such as age and KPS. A direct and statistically significant relationship between KPS and complications was observed ($P < 0.05$).

Key words: Brain Tumor, KPS, Patients, Hydrocephalus, Postoperative.

Introduction

The worldwide population is experiencing a phenomenon of ageing, especially in Western nations, which is resulting in a rise in healthcare needs [1,2]. Approximately 20% of the European Union's population in 2018 consisted of individuals aged 65 or older. Nevertheless, older patients exhibit a higher prevalence of

concurrent medical conditions, are more prone to experiencing postoperative complications, and demonstrate an elevated occurrence of neurosurgical disorders, all of which contribute to an escalating need for medical intervention [3,4,5].

The decision to perform surgery on elderly patients with BT is intricate, and it is influenced by factors such as the functional level before the operation, the nature of the pathology, the expected lifespan, and the overall quality of life. Prior to surgery, it is important to evaluate factors that can indicate the likely result or outcome [6,7].

This study seeks to investigate the influence of risk factors on both early and late clinical deterioration following neurosurgical procedures for intracranial tumours in patients aged 65 and above. Existing literature primarily focuses on surgical outcomes such as mortality [8], perioperative complications, and immediate postoperative results. [9]

Progress in molecular biology has prompted a more assertive strategy for handling brain tumours in older individuals, who have a bleak outlook and escalating death rates, especially in the case of malignant gliomas, the most prevalent type of primary brain tumours. [10]

Neurosurgical procedures to remove brain tumours in older individuals can result in postoperative problems, but the occurrence of such issues is rather rare. Frequent consequences encompass urinary tract infections, [11] deep venous thrombosis, the emergence of new neurological impairments, and surgery site infections. Risk is increased by factors such as older age, low-performance status, and comorbidities. [12,13] Notwithstanding these potential dangers, surgical intervention is seen as both achievable and secure.

Neurosurgical interventions, particularly brain tumor resection, are feasible and safe for the aging population, improving survival and quality of life. However, postoperative complications may occur. Benefits include less severe deterioration of quality of life and autonomy, and a significant improvement in progression-free survival. Careful preoperative geriatric evaluation is necessary for optimal tumor resection. [14]

The objective of this study is to assess the immediate clinical results of surgical removal of brain tumours in older patients (aged 65 years and above). The study will examine the benefits and drawbacks of cranial surgery for this specific patient population, taking into account factors such as the presence of many other medical conditions and overall poor health status. [15]

Material and method

Demographic information and data were collected from several different hospitals in Iraq, and the study period ranged from two years from the year 2021 to the year 2023. In this research, 80 patients who underwent Brain Tumor Resection were collected.

The ages of the patients ranged from 65 to 80 years

In this study, patients' demographic information and data were evaluated, which were related to height and weight, in addition to smoking and body mass index.

We conducted a retrospective analysis of patients' medical documents, examining pre- and postoperative Karnofsky Performance Status (KPS), the date of original tumor diagnosis, the date of death or last contact, age, sex, adjuvant treatment, and histological findings.

Subsequently, we computed the overall survival (OS) by measuring the time from the surgical procedure to either the date of death or the date of the last recorded interaction with the patient. Only patients who had

complete MRI data available for calculating pre- and postoperative volumes of contrast-enhancing tumors were included. Patients who had a tumor that returned or had missing data were not included in the study.

The data analysis was performed using IBM SPSS Statistics versions 24.0 and 26.0 (SPSS Inc., IBM). During descriptive data analysis, non-normally distributed data is represented using the median and interquartile range (IR), while regularly distributed variables are represented using the mean and standard deviation.

The patients were categorised into two groups: those who showed improvement or no change and those who experienced deterioration. This classification was based on the disparity between the preoperative Karnofsky Performance Status (KPS) and the KPS at discharge, as well as the difference between the preoperative KPS and the postoperative KPS. The declining group consisted of individuals who saw a reduction in Karnofsky Performance Status (KPS), although there was no significant clinical difference in postoperative.

Results

Table 1- general characteristics demographic of patients

Variable	f	P%
Age		
Mean ±SD		70±3.9
Sex		
Male	55	68.75
Female	25	31.25
BMI		
28-31	40	50
32-35	40	50
Comorbidities		
Arterial hypertension	23	28.75
Diabetes	40	50
Cardiovascular diseases	10	12.5
Renal problems	7	8.75
Education		
Primary	10	12.5
Secondary	30	37.5
College	20	25
High	20	25
Financial condition		
300-500$	13	16.25
500-700$	27	33.75
700-1000$	25	31.25
>1000$	15	18.75

Fig 1- Evaluate clinical outcomes according to diagnosis

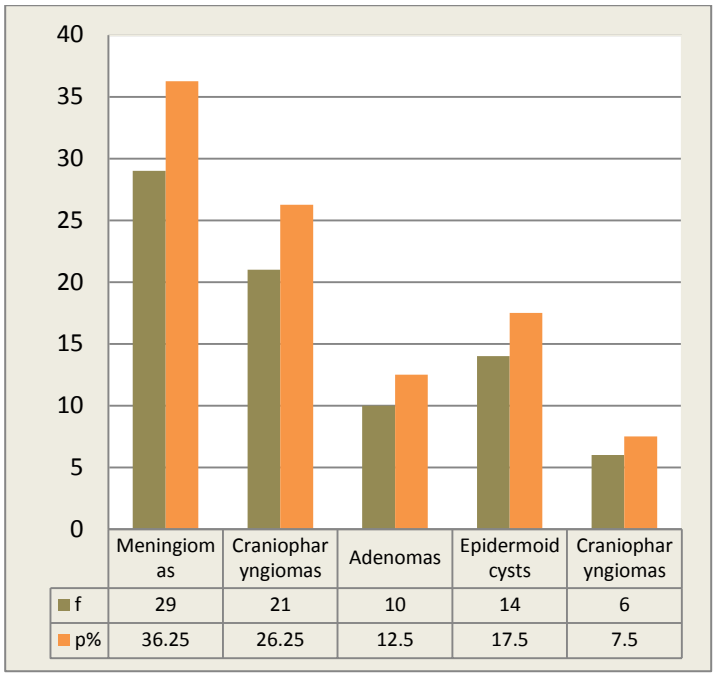


Fig 2- Evaluate clinical outcomes according to classification

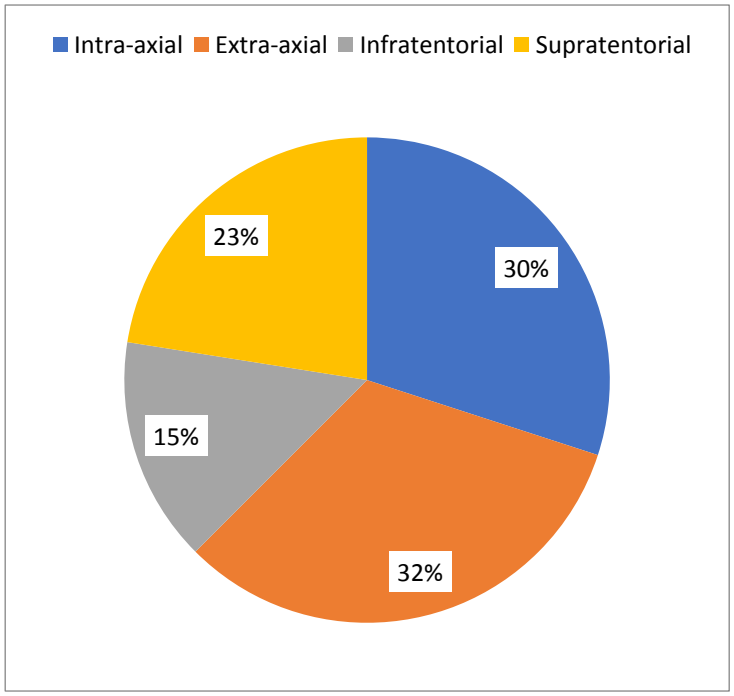


Fig 3- Side Brain Tumor of Iraqi patients .N=80

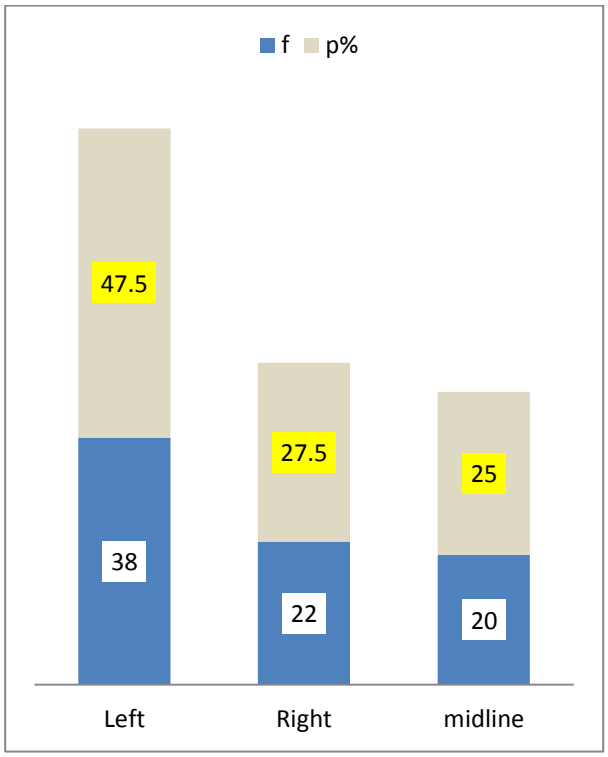


Table 2- Glasgow Coma Scale outcomes of patients

	mean	SD
eye-opening response	2.8	1.1
verbal response	3.1	1.4
motor response	2.89	1.23
Total	8.79	3.73

Table 3- secondary outcomes of patients according to Karnofsky Performance Scale and Complaint duration, BL

	Mean	Sd

KPS pre	55.76	19.44
Operative time	4.11	0.98
Complaint duration	12.3	10.087
BL (cc)	613.7	255.8
KPS post	69.9	29.6

Variable	F	p%
no	41	51.25
Bleeding	5	6.25
Infection	4	5
Neurological deficits	6	7.5
Cerebral edema	2	2.5
Seizures	2	2.5
Hydrocephalus	3	3.75
Stroke	3	3.75
Headaches and pain	8	10
Mortality	6	7.5
Glasgow Coma Scale Postoperative	14.21	1.976

Table 4- The final results presented to patients according to the prevalence of complications

Table 5- presents the correlation between mortality and the pre-existing (KPS) status.

		KPS less than 70	70 or more
Death	Yes	4	2
	No	25	51
Total		29	53

Table 6- logistic regression to analysis risk factor of patients

	CI	Range
Age	1.829	1.1-3.1
Sex	1.09	0.7-1.44
KPS	3.3	2.5-5.5
Bleeding	2.02	1.44-4.32
Glasgow Coma Scale	2.76	1.66-4.982
BL	1.67	0.89-3.34
Arterial hypertension	1.403	0.98-2.88

Discussion

The classification of brain tumours encounters various obstacles, including inefficient manual detection, misclassification, the administration of large-scale data, geographic and structural heterogeneity, intricate tumour shapes, and insufficient expertise in developing nations. Enhanced segmentation and classification models are required to precisely diagnose and assist medical professionals in their categorization [15].

Artificial neural networks (ANN) and deep learning approaches are utilised to classify brain tumours. These techniques involve pre-processing brain pictures, extracting statistical data, and utilising deep convolutional neural networks to extract significant information. Support Vector Machine (SVM) is highly efficient for handling massive datasets, surpassing other methods in terms of performance. [16,17,18]

The study population was 70±3.9 years old, with a mean volume of 121.22 cm2 and a mean blood loss of 613.7 +255.8 cc tumor.

In this study, patients were distributed according to gender: Male for 55 patients with 68.75%, Female for 25 patients with 31.25%, and patients were distributed according to Comorbidities, as the most prevalent in this study was Diabetes for 40 patients with 50% following Arterial Hypertension for 23 patients with 28.75% following Cardiovascular diseases to 10 patients with 12.5%

The previous study emphasised the significance of MRI in the categorization of brain tumours, showcasing a variety of procedures. Notably, techniques such as DWT, GLCM, and PCA were found to be beneficial for preprocessing and extracting features. For classification purposes, it is advisable to use Support Vector Machines (SVM) with suitable kernel approaches. In another study, the importance of adopting a taxonomic approach to comprehend the wide range of brain tumours is highlighted. Both studies concentrate on utilising shape analysis techniques. Asodekar employs shape features to differentiate between benign and malignant tumours, while Wu proposes a method based on 3D shape analysis, which achieves a high level of accuracy in classification.

The Karnofsky Performance Scale (KPS) is a standard method for measuring the ability of cancer patients to perform routine tasks. The scores on the KPS range from 0 to 100, with a higher score indicating that the patient is more able to perform daily activities. The KPS can be used to determine a patient's prognosis, measure changes in a patient's ability to function, or determine whether a patient should be enrolled in a clinical study.

Table 3 shows the secondary outcomes of the patients based on the Karnofsky Performance Scale. The patients' evaluation preoperative was 55.76 + 19.44. postoperative, there was an improvement in the KPS score, with a true value and arithmetic mean of 69 + 29.6.

The Karnofsky Performance Scale (KPS) is a tool used to assess the functional status of individuals with brain tumours. However, research suggests that KPS may be the most precise or reliable method for predicting overall survival. The Neurologic Assessment in Neuro-Oncology scale and Clinical Frailty Scale provide more reliable data, suggesting that the Karnofsky Performance Status (KPS) may be the most reliable measure.

The surgical removal of brain tumours can result in a range of consequences. The likelihood of these issues is influenced by factors such as the age of the patient, preoperative performance scale scores, past exposure to radiation, the location of the tumour, and the extent of its invasion. Specific forms of brain tumours can give rise to complications, including infection, bleeding, and neurological abnormalities. These complications may necessitate the use of modified surgical procedures and reconstruction techniques. Nevertheless, the selection of surgical technique, such as en bloc resection, does not inherently elevate the likelihood of postoperative problems [19,20]

In our study, risk factors for patients were found, which were represented by knowledge of logistic regression

Several factors have been found, such as advanced age, which contribute to the worsening of complications for patients, in addition to KPS were. These are the factors that led to an increase in mortality in this study. Despite this, it was noted that the prevalence of complications decreased in this study.

Other factors that increase the risk of diabetes complications include arterial hypertension and weight loss. In general, complication rates for brain tumor resection range from 12% to 30%, with mortality rates ranging from 1.0% to 15%.

Conclusion

In this study, we conclude that the prevalence of complications among Iraqi patients who underwent Brain Tumor Resection was significantly related to several factors, including age and KPS, as a direct, statistically significant relationship with KPS was found at P Value < 0.05.

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