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# Different Treatment Lines of Parasagittal Meningioma

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**Abstract:**
**Background:** Parasagittal Meningiomas are a kind of intracranial tumour that must be treated surgically. Because of the wide range of symptoms that may accompany these tumours, choosing a course of therapy can be difficult. This research set out to compare several approaches to managing parasagittal meningioma, such as observation, microsurgery, and Gamma Knife Radiosurgery. **Methods:** This Over the course of two years, 39 patients participated in a prospective observational research. Microsurgical excision alone, microsurgical excision followed by adjuvant Gamma Knife Radio Surgery, and initial Gamma Knife Radio Surgery were the three therapy modalities used to categorise patients. In this study, we evaluated a number of clinical, radiological, and surgical factors. **Results:** Seizures was the primary presenting complaint regardless of therapy. The decision to use microsurgical resection alone or in conjunction with Gamma Knife Radio Surgery was strongly impacted by tumour size. The requirement for microsurgery and adjuvant radiosurgery increased in patients with SSS invasion. Surgical outcomes were tracked and evaluated with regards to Simpson grading, blood transfusion, and complications such vascular damage. The percentage of patients who had a recurrence of their tumour after surgery was recorded. **Conclusions:** The research showed that microsurgical intervention and gamma Knife radiosurgery, either alone or in combination, may be an effective treatment for slowing the progression of parasagittal meningioma, with fewer side effects than conventional chemotherapy and radiation.

**Keywords:** Parasagittal meningioma, microsurgery, gamma knife radiosurgery, intracranial tumours, sagittal sinus invasion, and vascular injury are all terms that have been studied extensively.

## 1.Introduction

Meningioma is the main neoplasm seen most often within the adult brain. The annual incidence rate is 8.33 per 100,000 people, making it the third most common primary cerebral tumour. Meningioma affects 2.27 times as many women as men in infancy but affects both sexes equally in adulthood. 16.8-25.6 percent of all intracranial meningiomas are parasagittal meningiomas, which adhere to the outer layer of the Superior Sagittal Sinus and displace brain tissue. [1].

The clinical presentation is determined by where in the Superior Sagittal Sinus the lesion is located: in the first third, personality changes occur, in the second third, seizures and progressive hemiparesis occur, and in the third, hemianopsia might occur [2, 3]. MRI is the preferred diagnostic tool because of its ability to reveal heterogeneous signal increase after gadolinium injection. Calcification and bone response may be detected by CT [4].

Parasagittal meningiomas have a wide range of treatment choices, with conservative management and periodic examination being an option for small, asymptomatic tumours [5, 6]. Excision at a microscopic level is difficult because of the potential for damage to the veins [6]. Small, asymptomatic tumours are good candidates for stereotactic radiosurgery. Radiation treatment and chemotherapeutic medicines like Hydroxyurea and interferon 2 B may be recommended for advanced or recurring instances [3].

As a result, the purpose of this research was to compare the efficacy of three distinct approaches to the management of parasagittal meningioma: conservative therapy, microsurgical intervention, and Gamma Knife Radiosurgery.

## 2.Patients and Methods

### Patients:

This Over the course of two years (October 2020 - October 2022), the Neurosurgery Department at Benha University Hospitals and International Medical Centre performed a prospective observational research. There were a total of 39 patients included in the study, 14 males and 25 females, with a mean age of 46.7 years old. Of these patients, 20 underwent only microsurgical excision, 13 underwent microsurgical excision followed by adjuvant gamma knife, and 6 underwent Gamma Knife Radiosurgery as the initial therapy.

### Methods:

All Patients were examined thoroughly, including a complete history and physical, a neurologic evaluation, and any necessary imaging studies.

Methods of Treatment 1 - Microsurgical Resection [7]:

When deciding on an approach and a location, it is important to consider which part of the

SSS is being worked on. The basic notion is to have eloquent cortex slip away by gravity. Example 1

**Parasagittal meningioma surgery, intraoperative placement, figure 1.** When doing dural reconstruction, the pericranial tissue is always meticulously maintained. In order to prevent cutting through the sinus on the side of the tumour, craniotomies are often conducted in two phases: first, a bone flap is raised on the side of the tumour, and then the dura is stripped and a flap is raised on the opposite side of the sinus. Bone invasion is treated with rongeurs or a high-velocity drill. Once the bone flap has been raised, moderate pressure with cotton strips and continuous saline irrigation may be used to stop venous bleeding from the SSS. The dural incision begins across from the SSS and winds laterally to follow the tumor's front and back. Dissection of the tumour is performed circumferentially from the periphery to the midline, from the surface to the depth, with meticulous coagulation and division of all the small blood vessels between the brain and the tumour capsule followed by internally debulking using Cavitron or loop cautery to decrease traction on the brain. Example 2

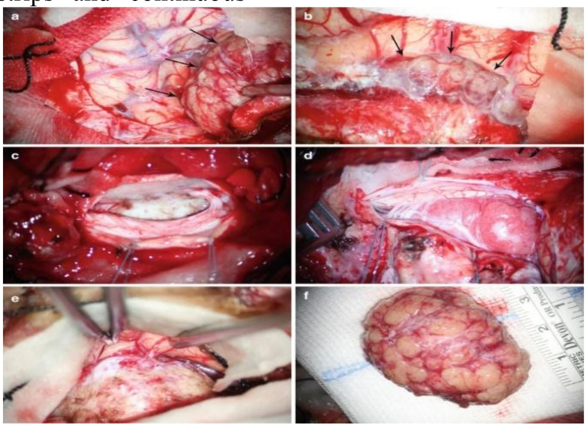

**Fig. (2)** Meningioma intraoperative presentations (a-e). A meningioma is shown by the black arrows. Surgically removed tumour (f)

**- Closure:** After the pericranial tissue needed for dural repair has been properly conserved, the dura may be closed. If the meningioma has invaded the skull bone, an acrylic cranioplasty will be used to rebuild the skull.

C- Clinical and radiological monitoring of patients immediately after surgery. After leaving the hospital, patients will have clinical visits once a week for a month, and once every three months after that. C.T. brain scans are used for postoperative radiological monitoring. After 3 months post-operatively, a contrast-enhanced MRI is performed to identify any remaining lesions that should be treated with Gamma Knife Radiosurgery as an adjuvant therapy.

At the International Medical Centre, 13 patients received GKRS as adjuvant treatment, while 6 patients had GKRS as primary therapy. The ICON model of the Gamma Knife was utilised for the procedure.**Figure 3**


**Icon of a Gamma Knife (Figure 3) [8].**

Assurance of the medical therapy as antiepileptic medications at the day before treatment to all patients was done. Every patient was treated in a single GKRS session and admitted on the same day they were released. Leksell frame was put to all patients under mild sedation and local anaesthetic. All patients had a fresh round of contrast-enhanced MRI (axial, sagittal and coronal images). Average tumour coverage was 98% with a GKRS dosage between 12 and 15 Grey.

All patients were sent home on the same day, with two days' worth of paracetamol and dexamethasone therapy. Clinical and radiological (new contrasted MRI) evaluation were planned for the initial follow-up visit after 6 months, with further visits planned after 1 year.

## 3. Results

The Thirty-nine patients with parasagittal meningioma were split evenly between 14 males and 25 females, spanning an age range of 32-69 years old, in this study's therapy groups. There were three distinct categories of patients: Patients were divided into three groups: Group 1 consisted of 13 individuals who had microsurgery followed by adjuvant Gamma Knife radiosurgery; Group 2 included 20 individuals who underwent microsurgery; and Group 3 included 6 individuals who underwent Gamma Knife radiosurgery. See Table 1 for a breakdown of the patient populations in each treatment arm.

| Treatment | G1 (microsurgery + adj. radiosurgery) | | G2 (Microsurgical) | | G3 (Gamma Knife Radiosurgery) | |
|---|---|---|---|---|---|---|
| | No | % | No | % | No | % |
| **Sex** | | | | | | |
| **Male** | 6 | 46.2 | 4 | 20.0 | 4 | 66.7 |
| **Female** | 7 | 53.8 | 16 | 80.0 | 2 | 33.3 |
| **Age/y** | | | | | | |
| **mean** | 46.69 | | 49.05 | | 49.67 | |
| **S.D.** | 8.78 | | 7.59 | | 11.29 | |

In all three therapy groups, seizures were the most prevalent first symptom (92.3 percent in group 1, 65 percent in group 2, and 50 percent in group 3). (3). Microsurgery or microsurgery with adjuvant Gamma Knife radiosurgery was recommended for patients who presented with contralateral weakness. Eight patients in Group 1 and nine patients in Group 2 had what is called "contralateral weakness," or weakness on the unaffected side of the lower extremities (2). When looking at additional clinical symptoms, there was no discernible difference between the therapy groups.

Parasagittal meningioma was divided into three categories in this research, depending on its position relative to the S.S.S. Six individuals had bilateral parasagittal meningioma (right and left). The size of the tumour was substantially connected with the line of therapy, with mean tumour sizes of 41.2 cc for group (1), 26.8 cc for group (2), and 3.3 cc for group (3), suggesting a very significant statistical difference. Treatment groups 1 and 2 had a small number of instances each of cystic and hemorrhagic alterations, whereas group 3 had none at all (3). Invasions of the superior sagittal sinus (S.S.S.) were found in 6 patients, most often in the middle and posterior thirds, and were treated with microsurgery followed by adjuvant radiosurgery. One instance of S.S.S. invasion in the anterior third was treated with microsurgery alone. Table 2

**Table (2)** for a breakdown of radiological results by treatment group.

| Treatment | G1 (Microsurgery + adj. radiosurgery) | G2 (Microsurgical) | G3 (Gamma Knife |
|---|---|---|---|

| | | | | | Radiosurgery) | |
|---|---|---|---|---|---|---|
| | No | % | No | % | No | % |
| **Site** | | | | | | |
| **Ant. Rt.** | 0 | 0.0 | 4 | 20.0 | 1 | 16.7 |
| **Ant. Lt.** | 0 | 0.0 | 2 | 10.0 | 0 | 0.0 |
| **Mid. Rt.** | 4 | 30.8 | 5 | 25.0 | 1 | 16.7 |
| **Mid Lt.** | 3 | 23.1 | 7 | 35.0 | 3 | 50.0 |
| **Mid. both** | 6 | 46.2 | 0 | 0.0 | 0 | 0.0 |
| **Post. Rt.** | 0 | 0.0 | 2 | 10.0 | 0 | 0.0 |
| **Post. Lt.** | 0 | 0.0 | 0 | 0.0 | 1 | 16.7 |
| **Size** | | | | | | |
| **Mean** | 41.15 | | 26.75 | | 3.25 | |
| **S.D.** | 26.21 | | 8.98 | | 0.94 | |
| **MRI** | | | | | | |
| **Cystic** | 1 | 7.7 | 2 | 10.0 | 0 | 0.0 |
| **Hemorrhage** | 0 | 0.0 | 2 | 10.0 | 0 | 0.0 |
| **Normal** | 12 | 92.3 | 16 | 80.0 | 6 | 100 |
| **SSS invasion** | 6 | 46.2 | 1 | 5.0 | 0 | 0.0 |
| **SSS compression** | 0 | 0 | 4 | 20.0 | 0 | 0.0 |
| **No** | 7 | 53.8 | 15 | 75.0 | 6 | 100 |
| **Venous congestion** | 4 | 30.8 | 4 | 20.0 | 0 | 0.0 |

Linear incisions were done on one patient in group (1) and on eight patients in group (2) when comparing microsurgery followed by adjuvant radiosurgery and microsurgical groups based on surgical findings (2). Six patients in group (2) had vascular injuries (four S.S.S. injuries and two cortical vein injuries; however, these results were not statistically significant), while two patients in group (1) experienced vascular injuries (one S.S.S. injury) (1). Four patients in group (1) and eight patients in group (2) needed a blood transfusion (2). Eight patients in Group 1 and thirteen patients in Group 2 had tumour excisions graded as G. (2) using the Simpson grading system, while four patients in Group 1 and one patient in Group 2 had excisions graded as G. (3), and six patients in Group 1 and one patient in Group 2 had excisions graded as G. (4). (2). Higher Simpson scores were shown to be associated with S.S.S. invasions. Table 3

**Surgical results are compared between the microsurgical and microsurgical + adjuvant radiosurgery groups in Table 3.**

| Treatment | G1 (Microsurgery + adj. radiosurgery) | | G2 (Microsurgical) | |
|---|---|---|---|---|
| | No | % | No | % |
| **Skin incision** | | | | |
| **Linear** | 1 | 7.7 | 8 | 40.0 |
| **U-shaped** | 12 | 92.3 | 12 | 60.0 |
| **Vascular injury** | 2 | 15.4 | 6 | 30.0 |
| **Blood transfusion** | 4 | 30.8 | 8 | 40.0 |
| **Simpson** | | | | |
| **2** | 8 | 61.5 | 13 | 65.0 |
| **3** | 4 | 30.8 | 1 | 5.0 |
| **4** | 6 | 7.7 | 1 | 30.0 |

One patient in the microsurgical group and two patients in the microsurgery with adjuvant radiosurgery group had surgical wound infections, all of which were treated conservatively. Five patients in Group 1 and seven individuals in Group 2 needed conservative care for postoperative bleeding; Nine patients in Group 1 had a positive clinical result, sixteen patients in Group 2, and six patients in Group 3 had a positive clinical outcome, respectively (3). One patient in group (1) had a worsening of weakness, while two two patients in Group 1 required surgical intervention (2). Three patients in group 2 had venous infarction as a consequence of cortical vein damage, and this was associated with venous congestion prior to surgery. One patient in group (1) and three patients in group (2) also experienced weakness impairment (2).

patients in group (2) experienced post-operative bleeding that required surgical intervention (2). Three patients in group (1) suffered tumour recurrence; one had received hormonal therapy for breast cancer 18 months after surgery, while the other two experienced recurrence 16 and 20 months after surgery, respectively, because to their originally large tumour sizes and higher Simpson grades. Additionally, recurrence occurred in 1 patient from group (2), who had received hormonal treatment for breast cancer after 12 months. One unfortunate patient, originally diagnosed with a parasagittal meningioma in the middle third, developed lower limb deep venous thrombosis, pulmonary embolism, and ultimately died due to these complications after receiving conservative treatment for the bleeding at the tumour bed. Table 4

**Clinical results for all groups are summarised in Table 4.**

| Treatment | | G1 (Microsurgery + adj rad) | | G2 (Microsurgical) | | G3 (Gamma Knife Radiosurgery) | |
|---|---|---|---|---|---|---|---|
| | | No | % | No | % | No | % |
| **Favorable outcome** | | 9 | 69.2 | 16 | 80.0 | 6 | 100 |
| **Complications** | **Deteriorated weakness** | 1 | 7.7 | 0 | 0.0 | 0 | 0.0 |
| | **Post op. hemorrhage** | 0 | 0.0 | 2 | 10.0 | 0 | 0.0 |
| **Recurrence** | **Cancer breast** | 1 | 7.7 | 1 | 5.0 | 0 | 0.0 |
| | **Large residual** | 2 | 15.4 | 0 | 0.0 | 0 | 0.0 |
| **Mortality** | | 0 | 0.0 | 1 | 5.0 | 0 | 0.0 |

Tumors found in the anterior third of the S.S.S. appeared to be related with a positive result when comparing groups with good and bad outcomes after microsurgical treatment, but this connection did not achieve statistical significance. When the invaded sinus was kept for adjuvant Gamma Knife radiosurgery, a statistically significant connection was seen between a positive result and S.S.S involvement (P 0.001). The incidence of venous congestion, which is associated with postoperative bleeding (P value 0.001), was considerably greater in patients who had poor outcomes. Distinctions between groups with good and bad outcomes based on radiologic results are shown in Table 5.

| Treatment | Favorable outcome (31) | | Unfavorable outcome (8) | | Statistical test | P value |
|---|---|---|---|---|---|---|
| | No | % | No | % | | |
| **Site** | | | | | | |
| **Ant. Rt.** | 4 | 9.7 | 1 | 25.0 | FET= 3.53 | 0.774 |
| **Ant. Lt.** | 2 | 6.5 | 0 | 0.0 | | |
| **Mid. Rt.** | 8 | 25.8 | 2 | 25.0 | | |
| **Mid. Lt.** | 11 | 35.4 | 2 | 25.0 | | |
| **Mid. both** | 4 | 12.9 | 2 | 25.0 | | |
| **Post. Rt.** | 2 | 6.5 | 0 | 0.0 | | |
| **Post. Lt.** | 1 | 3.2 | 0 | 0.0 | | |
| **MRI** | | | | | | |
| **Cystic** | 2 | 6.5 | 1 | 12.0 | FET= 0.097 | 0.705 |
| **Hemorrhage** | 2 | 6.5 | 0 | 0.0 | | |
| **None** | 27 | 87.1 | 7 | 87.5 | | |
| **Venous congestion** | | | | | | |
| **Yes** | 2 | 6.5 | 6 | 75.0 | FET= 14.4 | <0.001** |
| **No** | 29 | 93.5 | 2 | 25.0 | | |

No statistically significant differences were found between the two groups regarding skin incision, blood transfusion, or histological kinds of meningioma when comparing favourable and unfavourable microsurgical treatment result groups based on surgical findings. Vascular damage, however, was substantially more common in the group with negative outcomes than in the group with positive outcomes (P 0.001). Although high Simpson grade was significantly (P 0.004) related to S.S.S. involvement and recurrence, it was not related to the date of recurrence. Distinctions between groups with good and bad surgical outcomes are laid forth in Table 6.

| Treatment | Favorable outcome (25) | | unfavorable outcome (8) | | Statistical test | P value |
|---|---|---|---|---|---|---|
| | No | % | No | % | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Skin incision** | | | | | | |
| **L-shaped** | 7 | 28.0 | 2 | 25.0 | FET= 0.0 | 1.0 |
| **U-shaped** | 18 | 72.0 | 6 | 75.0 | | |
| **Vascular injury** | | | | | | |
| **Yes** | 2 | 8 | 6 | 75.0 | FET= 11.4 | <0.001** |
| **No** | 23 | 92.0 | 2 | 25.0 | | |
| **Blood transfusion** | | | | | | |
| **Yes** | 7 | 28.0 | 5 | 62.5 | FET= 1.81 | 0.106 |
| **No** | 18 | 72.0 | 3 | 37.5 | | |
| **Simpson** | | | | | | |
| **2** | 19 | 76.0 | 2 | 25.0 | | |
| **3** | 1 | 4.0 | 4 | 50.0 | FET= 11.2 | 0.004** |
| **4** | 6 | 24.0 | 2 | 25.0 | | |

Conservatively managed bleeding was substantially related with the unfavourable result group compared to the favourable outcome group based on surgical complications (P value 0.002). In addition, preoperative venous congestion and cortical vein damage were linked to a higher incidence of venous infarction in the poor outcome group (P 0.01). Although not statistically significant, S.S.S. and draining cerebral vein injuries tended to occur more often in the poor result group compared to the other surgical complications. Table 7

**Table (7)** Variations in surgical complications by group with good and bad outcomes

| **Treatment** | Favorable outcome (25) | | Unfavorable outcome (8) | | Statistical test | P value |
|---|---|---|---|---|---|---|
| | No | % | No | % | | |
| **Wound infection** | | | | | | |
| **Yes** | 1 | 8.0 | 2 | 12.5 | FET= 0.0 | 1.0 |
| **No** | 7 | 92.0 | 23 | 87.5 | | |
| **CSF leak** | | | | | | |
| **Yes** | 0 | 8.0 | 2 | 0.0 | FET= 0.0 | 1.0 |
| **No** | 8 | 92.0 | 23 | 100 | | |
| **Hemorrhage conservative** | | | | | | |
| **Yes** | 5 | 20.0 | 7 | 87.5 | FET= 9.2 | 0.002* |
| **No** | 20 | 80.0 | 1 | 12.5 | | |
| **Hemorrhage operative** | | | | | | |
| **Yes** | 0 | 0.0 | 1 | 12.5 | FET= 0.37 | 0.24 |
| **No** | 25 | 100 | 7 | 87.5 | | |
| **Weakness impairment** | | | | | | |
| **No** | 23 | 92.0 | 6 | 75.0 | FET= 3.3 | 0.205 |
| **Yes** | 2 | 8.0 | 1 | 12.5 | | |
| **More at L.L.** | 0 | 0.0 | 1 | 12.5 | | |
| **Venous infarction** | | | | | | |
| **Yes** | 0 | 0.0 | 3 | 37.5 | FET= 6.27 | 0.01* |
| **No** | 25 | 100 | 5 | 62.5 | | |

## 4.Discussion:

Meningiomas, the most frequent benign primary brain tumours, demonstrate a rising frequency in the elderly population. Untreated tumours may develop and cause related neurological problems [9], therefore first-line treatments include surgery, Stereotactic Radiosurgery (SRS), and observation are available. Tumor control rates and progression-free survival have improved significantly with SRS both as a main and adjuvant therapy for Grade I malignancies [10]. Positive results may also be seen with upfront SRS and microsurgical excision, while tumour growth is possible in certain individuals treated with SRS alone. Even though gamma knife radiosurgery (GKRS) has been around for a while and has fewer adverse effects than other treatments, there is still a chance of cerebral edoema after treatment [11]. The purpose of this research was to compare different approaches to treating parasagittal meningioma, such as conservative care, microsurgery, and Gamma Knife Radiosurgery.

When comparing our study's treatment groups to those of previous research, we found that:

Seizures were the most prevalent first symptom across all three research groups, with contralateral weakness second in both Group 1 and Group 2. (2). Other clinical symptoms such as headache, blurred vision, occasional confusion, visual impairment, dizziness, disrupted aware level, and frontal manifestations were not significantly different across treatment groups.

Parasagittal meningiomas are also treatable with microsurgery, GKRS, as was the case with 117 patients who were analysed in a retrospective study by Gatterbauer et al. [12]. The most common symptoms reported at the time of diagnosis were seizures, hemiparesis, and headaches. Headache was reported to be the most common first symptom (n = 18), followed by neurocognitive abnormalities (n = 12), weakness in the lower limbs (n = 11), hemiparesis (n = 12), seizures (n = 12), and hemianopsia (n = 4.5%) (Munich et al., 2013).

**Our investigation, along with previous studies, has shown radiological differences between treatment groups.**

Patients with parasagittal meningioma were divided into three categories in this analysis: those with tumours located in the anterior third, the middle third, and the posterior third, with 6 patients having tumours on both sides of their spinal column (Rt., Lt.). According to size of the tumour, there was substantial link between size of the tumour and line of therapy. Tumor sizes in groups 1 and 2 were statistically significantly larger than those in group 3, which had a mean tumour size of 3.3c.c. Group 1 had 11 patients with grade 1 perifocal vasogenic edoema (within 2 cm. of the tumour), group 2 had 13 patients with grade 2 perifocal vasogenic edoema (more than 2cm. surrounding the tumour but not involving the whole cerebral hemisphere), and group 3 had no patients with perifocal vasogenic edoema (3). Two patients in the group treatment had hemorrhagic abnormalities (2). The therapy group showed no evidence of cystic or hemorrhagic alterations (3). When comparing patients who had radiosurgery alone to those who received both treatments, Gatterbauer et al. [12] found that the combined-treatment group had a larger tumour volume at the time of the first intervention. In addition, Munich et al. [13] demonstrated that maximal tumour diameters were often between 3 and 6 cm (n = 50, 66%). Sixteen percent of the tumours were less than 3 centimetres in diameter, whereas 18 percent were larger than 6 centimetres. In 36 (47%) instances, lesions were found on the right side, in 29 (38%) cases, on both sides, and in 11 (12%). (14 percent ). The incidence rates were as follows: 36% in the anterior SSS section, 47% in the middle segment, and 13% in the posterior SSS segment (17 percent ). Raza et al. [14] observed that tumour distribution by position along the SSS was: 21 percent anterior, 62 percent intermediate, and 17 percent posterior. Parasagittal meningioma patients numbered 212 in the study of Chen et al. [15]. Diameters greater than 1 cm were surrounded by peritumoral edoema in 122 (57.5%) individuals with parasagittal meningiomas. Fifty percent of patients 38 had peritumoral edoema, as reported by Munich et al (50 percent ). In most instances of meningioma, significant cerebral edoema was found, as shown by research by Ihwan et al. [16].

Six patients in the current research had S.S.S invasion (5 in the middle third and 1 in the posterior third), and all six had microsurgery with adjuvant radiosurgery. One patient had S.S.S invasion in the anterior third, but only that case was treated with microsurgery. Specifically, Munich et al. [13] showed that 27 occurrences (36%) happened in the SSS's anterior section, 36 occurrences (47%) occurred in the SSS's middle segment, and 13 occurrences (6%) occurred in the SSS's posterior region (17 percent ). In 40 instances (53%), the SSS was not involved at all, in 27 cases (36%), and in 8 situations (10%), the SSS was completely blocked (11 percent ).

Our research and others that compared microsurgery with adjuvant radiosurgery found similar results to those of the microsurgical group.

In the current research, 4 patients in group (1) and 8 patients in group (2) received blood transfusions (2). The tumour resection was graded using the Simpson system. The incidence of group 1 (G. (2) in 8 patients) and group 2 (G. (2) in 13 patients) (2). Six patients with Group G. (4) in Group 1 and one patient in Group 2 (2). There was statistical link between greater Simpson grade and S.S.S invasion. Gatterbauer et al. [12] found a statistically significant (p 0.001) correlation between invasion of the superior sagittal sinus and the need for radiosurgery after a Simpson Grade IV resection. Simpson resection grade was I in 23.6%, II in 42.9%, III in 9.4%, and IV in 51.6%, as shown by Chen et al. [15]. (24.1 percent ).Our data suggest that 9 patients in Group 1, 16 patients in Group 2, and 6 patients in Group 3 all had successful clinical outcomes (3). One patient in the group treatment had deteriorating muscle strength (1). Two patients in the group treatment had postoperative bleeding that required surgical intervention (2). Three patients in group (1) had a tumour recurrence, one patient in group

(2) experienced a tumour recurrence, and one patient in group (3) passed away. Disease was under control in 86% of GKRS patients at a mean follow-up of > 6 years, as reported by Losa et al. [17]. Various approaches to employing GKRS as either a main or adjuvant therapy likely best explain the notable variation of tumour volume across different datasets. Large tumour volume has a detrimental influence on the chance of tumour control following GKRS. The majority of tumours seem to benefit from initial surgical debulking. Considering GKRS as soon as feasible following partial tumour excision or identification of recurrence is crucial for minimising the quantity of diseased tissue left behind.

There was no discernible difference in age or gender between the successful and unsuccessful participants in our research.

There was no statistically significant correlation between age at presentation and recurrence, or between sex of patient and recurrence, according to the research conducted by Pazhaniyandi and Ramkumar [18].

Differences between positive and unfavourable microsurgical treatment result groups according to surgical complications in our research and other studies.

When we looked at the other complications of surgery, we found that S.S.S. and draining cortical veins damage put patients in the unfavourable outcome group, even though this difference wasn't statistically significant. In line with our findings, Cucu et al. [19] analysed the medical records of 21 people who had been diagnosed with parasagittal meningioma in the past. SSS invasion was observed to be associated with tumour recurrence, with 69% of patients experiencing recurrence having invasive SSS.

Additionally, Schmutzer et al. [20] found 137 individuals with WHO grade I meningioma affecting the SSS. According to their findings, the recurrence rate for meningiomas of the SSS treated with stereotactic radiosurgery is 12.4%. (17 patients).

[18] found a statistically significant link between sinus involvement and poor outcomes including bleeding and recurrence, corroborating our results.

Ostrom et al. [21] also found a link between a high Simpson grade and recurrence, which is consistent with our findings. But in 21 patients followed for 8 months to 5 years after surgery, Cucu et al. [22] reported no recurrence since there was no SSS invasion. Our results agreed to Ostrom et al. [21] who revealed that the medical consequences included pulmonary embolism, thrombosis, and pneumonia. Having a sinus resection or opening done increases the risk of surgical complications, however this is not statistically significant (18 percent vs 13 percent for subtotal resection).

## 5. Conclusions

The research showed that parasagittal meningiomas may be effectively treated with microsurgical intervention and Gamma Knife radiosurgery as initial or supplemental therapy, with fewer problems than either microsurgery or Gamma Knife radiosurgery alone.

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