

Retrospective Assessment of Incidence of Venous Thrombosis After Brain Tumor Surgery: An Institutional Based Study

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ABSTRACT

Background: Cancer patients in general are at significantly increased risk of developing venous thromboembolism (VTE). Patients undergoing craniotomy for brain tumor resection have a high risk for post-operative VTE. Hence; the present study was undertaken for analyzing of incidence of Venous thrombosis after brain tumor surgery.

Materials & Methods: A total of 207 patients who underwent brain tumor surgeries were enrolled. Surgical inclusion criteria required patients of a minimum of 18 years of age undergoing first craniotomy for meningioma, glioma or cerebral metastasis. Patients who suddenly developed venous thrombosis preoperatively or more than 4 weeks postoperatively were excluded. Incidence of venous thrombosis was evaluated. Complete demographic details and clinical data of all the patients were obtained. Preoperative and postoperative radiographs were analyzed.

Results: Data of a total of 207 patients was analyzed. Among these, 56 patients were of meningioma, 110 patients were of Glioma and the remaining 41 patients were of metastasis. Venous thrombosis was present in 7.14 percent, 2.72 percent and 2.44 percent of the patients with meningioma, glioma and metastasis respectively. Overall incidence of venous

thrombosis was 3.86 percent. Majority of the patients with venous thrombosis were males. Mean BMI of the patients with venous thrombosis was 26.9 kg/m².

Conclusion: Patients with brain tumors are at a significant risk for development of venous thrombosis. Hence; neurosurgeons should analyze all the risk factors associated with surgery preoperatively for improving the prognosis of the disease.

Keywords: Venous Thrombosis, Brain Tumor, Surgery.

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INTRODUCTION

Brain tumors represent a diverse group of neoplasms classified into either primary brain tumors, which originate from within the central nervous system (CNS), or secondary brain tumors (metastatic), which are spread from a tumor elsewhere in the body. Cancer patients in general are at significantly increased risk of developing venous thromboembolism (VTE). Patients undergoing craniotomy for brain tumor resection have a high risk for post-operative VTE, and the incidence was reported to be 32% in neurosurgical patients who were mainly operated for brain tumor with mechanical prophylaxis but no anticoagulant prophylaxis.¹⁻³

Anticoagulation increases the risk of intracranial hemorrhage (ICH), which is one of the most frequent and feared complications in patients undergoing operations for brain tumors. Although the incidence of ICH is lower compared to VTE events, their outcomes can be at least as detrimental. Only few predictors associated with

ICH have been identified including history of craniotomy, use of bevacizumab, and therapeutic anticoagulation for a VTE.⁴⁻⁶ Hence; the present study was undertaken for analyzing of incidence of Venous thrombosis after brain tumor surgery.

MATERIALS & METHODS

The present study was undertaken for analyzing of incidence of Venous thrombosis after brain tumor surgery in the Department of Neurosurgery, Sawai Man Singh Medical College & Hospital, Jaipur, Rajasthan, India. A total of 207 patients who underwent brain tumor surgeries were enrolled. Ethical approval was obtained from institutional ethical committee. Patients undergoing stereotactic biopsy, brachytherapy or repeated craniotomy were excluded. Surgical inclusion criteria required patients of a minimum of 18 years of age undergoing first craniotomy for meningioma, glioma or cerebral metastasis. Patients who

suddenly developed venous thrombosis preoperatively or more than 4 weeks postoperatively were excluded. Incidence of venous thrombosis was evaluated. Complete demographic details and clinical data of all the patients were obtained. Preoperative and postoperative radiographs were analyzed. All the results were recorded in Microsoft excel sheet and were analyzed by SPSS Software.

RESULTS

Data of a total of 207 patients was analyzed. Among these, 56 patients were of meningioma, 110 patients were of Glioma and the remaining 41 patients were of metastasis. Venous thrombosis was present in 7.14 percent, 2.72 percent and 2.44 percent of the

patients with meningioma, glioma and metastasis respectively. Overall incidence of Venous thrombosis was 3.86 percent. Mean age of the meningioma patients, glioma patients, and metastasis patients with presence of venous thrombosis was 58.3 years, 59.4 years and 60.5 years respectively. Majority of the patients with venous thrombosis were males. Mean BMI of the patients with venous thrombosis was 26.9 kg/m². Among the 4 patients of meningioma with venous thrombosis, tumors in two patients were situated at convexity while one patient at parasagittal region and Parasellar region respectively. Among the 3 patients of Glioma with venous thrombosis, tumors in two patients were of Glioblastoma multiforme. Metastasis patient was of adenocarcinoma.

Table 1: Incidence of venous thrombosis

Variable	Meningioma (n=56)	Glioma (n=110)	Metastasis (n=41)	Total (n=207)
Venous thrombosis: Number	4	3	1	8
Venous thrombosis: Incidence	7.14	2.72	2.44	3.86

Table 2: Demographic data of patients with venous thrombosis

Variable	Meningioma (n=4)	Glioma (n=3)	Metastasis (n=1)	Overall (n=8)
Mean age (years)	58.3	59.4	60.5	59.1
Males (%)	75	66.67	100	75
Females (%)	25	33.33	0	25
Mean BMI (Kg/m²)	26.5	27.4	26.8	26.9

Table 3: Tumor variables of patients with venous thrombosis

Variable	Meningioma (n=4)	Glioma (n=3)	Metastasis (n=1)	Overall (n=8)
Convexity	2	0	0	2
Parasagittal	1	0	0	1
Parasellar	1	0	0	1
Glioblastoma multiforme	0	2	0	2
Malignant astrocytoma	0	1	0	1
Adenocarcinoma	0	0	1	1

DISCUSSION

Venous thromboembolism (VTE), including deep venous thrombosis (DVT) and pulmonary embolism (PE), is a major cause of morbidity and mortality in patients undergoing craniotomy for primary malignant brain tumors. In addition to known surgical risk factors, such as venous stasis from perioperative immobility, endothelial injury, and inflammation from the operation itself, cancer is a recognized risk factor for VTE development. Among all cancer types, high-grade gliomas have been shown to result in second highest lifetime risk for cancer-related VTE, one of the highest risks of perioperative VTE and, when comparing craniotomy for any brain tumor to craniotomy for non-neoplastic disease, rates of postoperative VTE have been reported to be twice as high.⁷⁻⁹ Hence; the present study was undertaken for analyzing of incidence of Venous thrombosis after brain tumor surgery.

Data of a total of 207 patients was analyzed. Among these, 56 patients were of meningioma, 110 patients were of Glioma and the remaining 41 patients were of metastasis. Venous thrombosis was

present in 7.14 percent, 2.72 percent and 2.44 percent of the patients with meningioma, glioma and metastasis respectively. Overall incidence of Venous thrombosis was 3.86 percent. Our results were in concordance with the results obtained by Senders JT et al and Levi AD et al, who also reported similar findings in their respective studies.^{8,9} Senders JT et al extracted all patients who underwent craniotomy for a primary malignant brain tumor from the National Surgical Quality Improvement Program (NSQIP) registry to perform a time-to-event analysis and identify relevant predictors of DVT, PE, and ICH within 30 days after surgery. Among the 7376 identified patients, the complication rates were 2.6, 1.5, and 1.3% for DVT, PE, and ICH, respectively. VTE was the second-most common major complication and third-most common reason for readmission. They demonstrated distinct critical time periods for the development of thrombotic and hemorrhagic events after craniotomy.⁸

In the present study, mean age of the meningioma patients, glioma patients, and metastasis patients with presence of venous

thrombosis was 58.3 years, 59.4 years and 60.5 years respectively. Majority of the patients with venous thrombosis were males. Mean BMI of the patients with venous thrombosis was 26.9 kg/m². Among the 4 patients of meningioma with venous thrombosis, tumors in two patients were situated at convexity while one patient at parasagittal region and Parasellar region respectively. Among the 3 patients of Glioma with venous thrombosis, tumors in two patients were of Glioblastoma multiforme. Metastasis patient was of adenocarcinoma. In another study conducted by Levi AD et al, authors retrospectively reviewed the incidence rate of clinical postoperative deep vein thrombosis and/or pulmonary embolism in 1703 patients undergoing initial craniotomy for meningioma, glioma, or cerebral metastasis. The incidence rate of clinical thromboembolic complications was 1.59% for all tumor groups within the first 4 weeks of surgery. Patients undergoing surgery for meningiomas had a statistically significant increased risk of thromboembolism despite fewer overall perioperative risk factors, when compared with the other tumor groups. The tumor-specific incidence rates of deep vein thrombosis and/or pulmonary embolism for meningioma, glioma, and metastasis were 3.09%, 0.97%, and 1.03%, respectively.⁹

Rinaldo L et al investigated the incidence and predictors of venous thromboembolic events (VTEs) after craniotomy for tumor resection. The authors investigated the incidence of VTEs in a consecutive series of patients presenting to the authors' institution for resection of an intracranial lesion. There were 1622 patients included for analysis. The incidence of VTEs was higher in patients receiving chemoprophylaxis than in patients not receiving chemoprophylaxis. There were 30 instances of clinically significant postoperative hemorrhage (1.9%), with only 1 hemorrhage occurring after initiation of VTE chemoprophylaxis.¹⁰ Prophylactic anticoagulation is a commonly used strategy to prevent VTE but should be carefully balanced against the risk of ICH. In previous studies, the rates of ICH following craniotomy for brain tumors is cited as 1.0–4.0% with a follow-up ranging between the initial hospital stay and long-term survival after surgery. However, definitions for major ICH varied between volumetric measurement of the hematoma, presence of symptoms, decrease in hemoglobin, or need for surgical evacuation of hematoma.¹¹⁻¹⁴

CONCLUSION

From the above results, the authors concluded that patients with brain tumors are at a significant risk for development of venous thrombosis. Hence; neurosurgeons should analyze all the risk factors associated with surgery preoperatively for improving the prognosis of the disease.

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