RESULTS OF SURGICAL TREATMENT OF MEDULLOBLASTOMAS AT VIETNAM NATIONAL CANCER HOSPITAL

Nguyen Duc Lien*, Hoang Thi Thuy Linh

ABSTRACT

Objective: Evaluate the results of surgical treatment of medulloblastoma at Vietnam National Cancer Hospital.

Subjects and methods: The study subjects include patients who underwent surgery and chemotherapy and radiotherapy at Vietnam National Cancer Hospital from January 2019 to December 2023, with pathological result of medulloblastoma, with complete medical records and MRI scans. Excluding cases of recurrent medulloblastoma, cases that only received surgery, refused chemotherapy or radiotherapy after surgery or cases that did not receive adequate treatment regimen. The study is cross-sectional, retrospective and prospective.

Results: A total of 45 patients underwent surgery: Total or near-total tumor removal (accounting for 93.3%), partial tumor removal 3/45 (6.7%), the overall complication rate after surgery was 11.1%. Results of 5-year follow-up after postoperative chemoradiotherapy: the overall survival rate and progression-free survival rate were 54.3±11.1 and 50.8±8.5, respectively. The high-risk group had a median survival of 34.3 months, the intermediate-risk group had a median survival of 64.7 months, the difference was statistically significant with p=0.001.

Conclusion: Histopathological types, molecular subgroups and risk stratification are important prognosticators, and are associated with overall and progression-free survival of MB patients

Key words: Medulloblastomas; neurosurgery; Risk stratification of MB.

1. INTRODUCTION

Medulloblastoma is the most common malignant brain tumor in children, accounting for about 15-20% of all primary tumors of the central nervous system and 30-40% of tumors in the posterior fossa[1,2]. Multimodal treatment including surgery, radiotherapy and chemotherapy has been widely applied in most patients. However, the overall survival rate is low, the rate of late complications related to treatment is high and this is a major challenge for pediatric oncologists and neurosurgery. Currently, medulloblastoma risk stratification is based on pathological type, tumor extent on magnetic resonance imaging and cerebrospinal fluid cytology (Chang classification system), extent of tumor resection and age; medulloblastoma is classified into three groups: standard risk, high risk and poor risk (children under 3 years old) with different treatment regimens and prognosis[3,4]. We conducted this study with the aim of: Evaluating the results of surgical treatment of medulloblastoma at Vietnam National Cancer Hospital.

Vietnam National Cancer Hospital
*Corresponding Author: drduclien@gmail.com
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2. SUBJECT AND STUDY METHOD

2.1. Subject

Inclusion criteria: patients who underwent

surgery and chemotherapy and radiotherapy at Vietnam National Cancer Hospital from January 2019 to December 2023. Pathologically diagnosed as medulloblastoma, with complete medical records and MRI scans.

Exclusion criteria: cases of recurrent medulloblastoma, cases that only underwent surgery, refused chemotherapy or radiotherapy after surgery Or cases that did not receive adequate treatment regimen.

2.2. Method

Cross-sectional, retrospective and prospective descriptive study. Study according to a unified medical record form, data on radiographs, pathological results, surgical methods, treatment regimens based on archived medical records and archived films. Evaluation of re-examination results based on clinical examination, MRI examination.

Risk stratification: 3 groups.

+ Standard risk: Over 3 years old, no metastasis in cerebrospinal fluid, residual tumor volume after surgery less than 1.5 cm^2, Pathology: classical or Desmoplatic

+ High risk: Over 3 years old, metastasis M1-M4, residual tumor volume after surgery more than 1.5 cm^2, pathology: large cell, anaplastic

+ Bad risk: Under 3 years old, in all types of pathology

Data processing: Descriptive statistics of quantitative variables: Mean, standard deviation, maximum value, minimum value. Description of qualitative variables by frequency and frequency (%). X2 comparison test, comparisons are statistically significant with $p < 0.05$. In case the sample is less than 5, use Fisher test. SPSS 20.0 software is used to process data.

Research ethics: This is a descriptive study, not a treatment intervention. The treatment regimen for medulloblastoma has been included in the 2021 Vietnamese cancer diagnosis and treatment guidelines by the Ministry of Health.

3. RESULTS

A total of 45 patients who met the inclusion and exclusion criteria were included in the study. The male/female ratio was 1.25/1, the youngest age was 3.1 years old, the oldest was 15 years old, the average age was 9.09 ± 3.28 years old. The size of the tumor on the preoperative brain MRI was less than 3 cm, accounting for 22.2%, the size was over 3cm, accounting for 77.8%. Surgical treatment results: 22/45 patients (48.9%) had total tumor removal, 20/45 (44.4%) had near-total tumor removal, 3/45 (6.7%) had partial tumor removal. The number of patients who underwent ventriculoperitoneal shunt surgery to treat hydrocephalus before tumor resection was 23/45 patients (51.1%). Postoperative complications: death (0%), cerebrospinal fluid leakage in 2/45 patients (4.4%), surgical site bleeding requiring reoperation in 1/45 (2.2%), post-tumor resection ventricular dilatation in 2/45 patients (4.4%). Pathological results: classical medulloblastoma (88.9%), desmoplastic/nodular medulloblastoma (4.4%), diffuse nodular medulloblastoma (2.2%), large/anaplastic medulloblastoma (4.4%).

Treatment results at 5-year follow-up, the overall survival rate and progression-free survival rate were 54.3±11.1 and 50.8±8.5, respectively. There were 14/45 patients who died during the follow-up period (31.1%). The survival time of the total tumor resection group was 53.9 months, which was longer than that of the near-total tumor resection group (51 months) and the partial tumor resection group (16.6 months) ($p=0.002$).

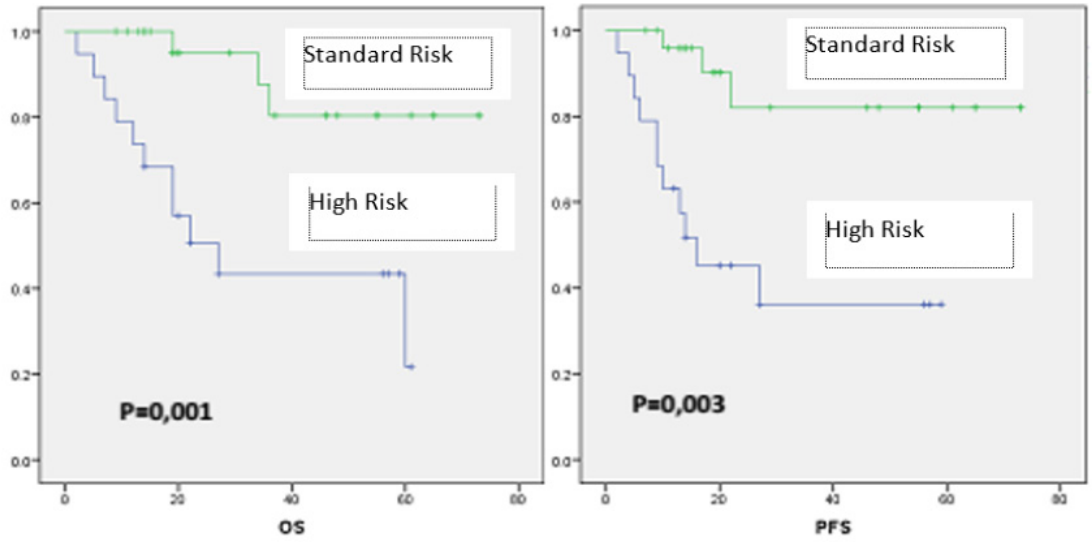

Figure 1: OS and PFS according to medulloblastoma risk stratification

Comments: the high-risk group had an average survival time of 34.3 months, the intermediate-risk group had an average survival time of 64.7 months, the difference was statistically significant with p=0.001.

4. DISCUSSION

Medulloblastoma (MB) is the most common malignant brain tumor in the pediatric population. Traditionally, MB has been classified as average- or high-risk, depending on patient age, presence of metastasis, extent of postsurgical residual disease, and histology in clinical risk stratification and treatment has been degraded in high-risk patients. A total of 45 patients were analyzed in this study: the mean age of the patient group in the study was 9.09 years old, of which the majority were children aged 7-15 years old (68.9%). The youngest patient was 3.1 years old, the oldest was 15 years old. Thus, our study group of patients was mainly in the standard-risk and high-risk stratification groups, with no poor-risk group.

In this study, all patients underwent tumor removal surgery under a microscope. Surgical results: Total or near-total tumor removal (93.3%), partial tumor removal 3/45 (6.7%). There were 3 cases of partial tumor removal due to tumor infiltration into the floor of the fourth ventricle and cerebellar peduncle, with a high risk of affecting respiratory and motor function if these structures are damaged. The rate of total/near-total tumor removal in the study of Pham Thanh Tuan[1] (2022) was 98.6%, of Haque[4] (2020) was 60%. Evaluation of postoperative chemotherapy and radiotherapy results: overall survival time of the total tumor removal group was 53.9 months, the near-total tumor removal group (51 months) and the partial tumor removal group (16.6 months). Thus, the total/near-total tumor removal group had better results than the partial tumor removal group (p = 0.002). The authors all agree that maximal tumor resection is very important, and that tumor size after surgery of less than 1.5 cm is a prognostic factor in the treatment of medulloblastoma[3,4,5].

In this study, 35 patients were admitted to the hospital with signs of increased intracranial pressure, of which 27/45 (60%) had hydrocephalus on MRI, all of whom were treated with medical treatment. However, 23 patients did not respond

to medical treatment, and their prognosis could not wait until tumor removal surgery, so they underwent ventriculoperitoneal shunting (51.1%). Three patients had ventriculoperitoneal shunting due to postoperative hydrocephalus. Postoperative complications: death (0%), cerebrospinal fluid leakage in 2/45 patients (4.4%), surgical site bleeding requiring reoperation in 1/45 (2.2%), post-tumor resection ventricular hydrocephalus in 2/45 patients (4.4%), and overall postoperative complication rate was 5/45 (11.1%). In case of postoperative bleeding, reoperation and hemostasis are required, and the ventricles are drained out, the patient is stable after 2 weeks of active treatment. Due to the characteristics of medulloblastoma, which is a soft tumor and has many blood vessels, in cases where the tumor cannot be completely removed, it is necessary to avoid bruising the remaining tumor tissue, and specialized hemostatic materials such as Floceal should be used. In Muzumdar's study of 211 patients who underwent surgery for medulloblastoma, 40 patients had postoperative complications (18.9%), of which postoperative complications were: 15 patients with surgical fossa hematoma, 1 patient with subdural hematoma, 22 patients with meningitis and cerebrospinal fluid leakage and 2 patients with postoperative blindness[5].

Evaluation of treatment results, with a 5-year follow-up period, the overall survival rate and progression-free survival rate were 54.3±11.1 and 50.8±8.5, respectively. There were 14/45 patients who died during the follow-up period (31.1%). In combination with clinical and pathological outcome indicators, molecular markers are not only prognostically important but will also facilitate the use of targeted therapies, such as GDC-0449, a novel SHH pathway inhibitor, particularly in infants and adults[5]. In the current study, the high-risk group has an average survival time of 34.3 months, the average risk group 64.7 months, the difference is statistically significant with p = 0.001. Nalita[6] et al. reported 84.4% and 42.8% OS rates of standard-risk and high-risk groups, respectively. Sirachainan[7] et al. reported OS rates of standard-risk and high-risk groups of 58–85% and 32–70%, respectively. Thompson[8] et al. reported that patients with postsurgical residual tumor $>1.5\,cm^2$ (an indicator of high-risk disease) had worse PFS and required aggressive treatment options. Juraschka[9] conclude clinical trials should incorporate key molecular profiles, including subgroup information, genetic, cytogenetic, and epigenetic changes, of this diverse disease entity that can suggest precise patients' outcomes or predict rational treatment strategies. The rarity of some WHO subtypes of MB; specifically, medulloblastoma with extensive nodularity, is considered a limitation of this study. Larger studies including all the histopathological types of medulloblastoma are recommended

5. CONCLUSION

Research results of 45 patients undergoing surgery and radiotherapy for medulloblastoma: Total or near-total tumor resection (93.3%), partial tumor resection 3/45 (6.7%), overall postoperative complication rate was 11.1%. With a 5-year follow-up period, the overall survival rate and progression-free survival rate were 54.3±11.1 and 50.8±8.5, respectively; the high-risk group had an average survival time of 34.3 months, the intermediate-risk group had an average survival time of 64.7 months, the difference was statistically significant with p=0.001.

In conclusion, histopathological types, molecular subgroups and risk stratification are important prognosticators and are associated with overall and progression-free survival of MB patients

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