Incidence of Surgical Intervened Central Nervous System Tumors in Puerto Rico

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Disclosure

- President of CLA Radiosurgery Group, Inc.

Introduction

- Will try to answer several questions:
  - What is the incidence of CNS tumors in Puerto Rico?
    - What is the histological diagnosis of patients that underwent surgery for CNS tumors?
      - Adults (≥18)
      - Children (0-17)
  - Is there is any difference between patients that are submitted to surgery in PR vs. USA?
  - What is the diagnosis of the patients that were treated with Radiosurgery in Puerto Rico?

Descriptive Profile of Surgically-confirmed Adult Central Nervous System Tumors in Puerto Rico

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***Introduction*: Published studies regarding the incidence of central nervous system (CNS) tumors in Puerto Rico (PR) are exceedingly rare. The general understanding is that the incidence of these tumors in Puerto Rico is similar to the one found in the United States of America (USA). The objective of this study is to describe the specific profile of all the CNS tumors that are surgically intervened in Puerto Rico, through the creation of a database.**

***Methods*: A retrospective analysis of all the surgical procedures from January 1, 2002 to May 31, 2006 for adult CNS tumors in Puerto Rico was performed. Each case was evaluated for demographic information, operative procedure, lesion description and official pathological report. Recurrent lesions were excluded. The information was organized to form a database of all the CNS neoplasms.**

***Results*: A total of 1,018 procedures for CNS tumors were performed on 1,005 patients. The incidence rate of surgically intervened CNS tumors in Puerto Rico is 6 per 100,000 people. CNS tumors were more common in women than in men (58% vs. 42%), respectively. The mean age was 52.4 years. The most common histological type found was meningioma WHO I (24%), followed by pituitary adenomas (16%), and glioblastoma multiforme (14%).**

***Conclusions*: Our results reflect a unique histopathological distribution of operated CNS tumors in Puerto Rico. In this series, primary tumors are more common than metastatic tumors. Benign histological tumors were more frequent than more malignant variants. Although this study reflects only the histologically diagnosed tumors, it is headway towards diagnosing the incidence of all CNS tumors in Puerto Rico.**

Key words: CNS tumors, Tumor incidence, Puerto Rico, Neurosurgery, Neuro-oncology

Introduction

- In general, the incidence rate of primary Central Nervous System (CNS) tumors in the United States is 14.8 per 100,000 person-years[1].
- Among the primary CNS tumors, the most common histological types are Meningiomas (30.1%), Glioblastoma Multiforme (20.3%), Astrocytomas (9.8%) and Pituitary Adenomas (6.3%)[1].

[1]CBTRUS: Central Brain Tumor Registry of the United States (Years 1998-2002), in 2005-2006

Introduction

- The exact incidence of metastasis to CNS is unknown (estimated 20-40%).
- It has being suggested that the incidence of metastasis is increasing and that its partially due to increase survival of cancer patients and better diagnostic tools [1,2].
- It is generally agreed that metastatic lesions are the most common adult intracranial neoplasm [1,2].

[1]Davis FG, McCarthy B: Epidemiology of brain tumors: incidence, survival and risks factors, in McLendon RE, Bigner DD, Rosenblum MK (eds): **Russell & Rubinstein's Pathology of Tumors of the Nervous System ed 7.** London: Hodder Arnold Publication, 2006, pp 11-35

[2]Gavrilovic IT, Posner JB: Brain metastases: epidemiology and pathophysiology. **J Neurooncol 75:**5-14, 2005

Tumor Experience in Puerto Rico

- The exact incidence of CNS tumors in Puerto Rico is unknown.
- There are only a few published scientific studies on the incidence of adult tumors of the Central Nervous System in Puerto Rico.
- The Department of Health has a cancer registry. It gathers information about primary malignant tumors.

Methods

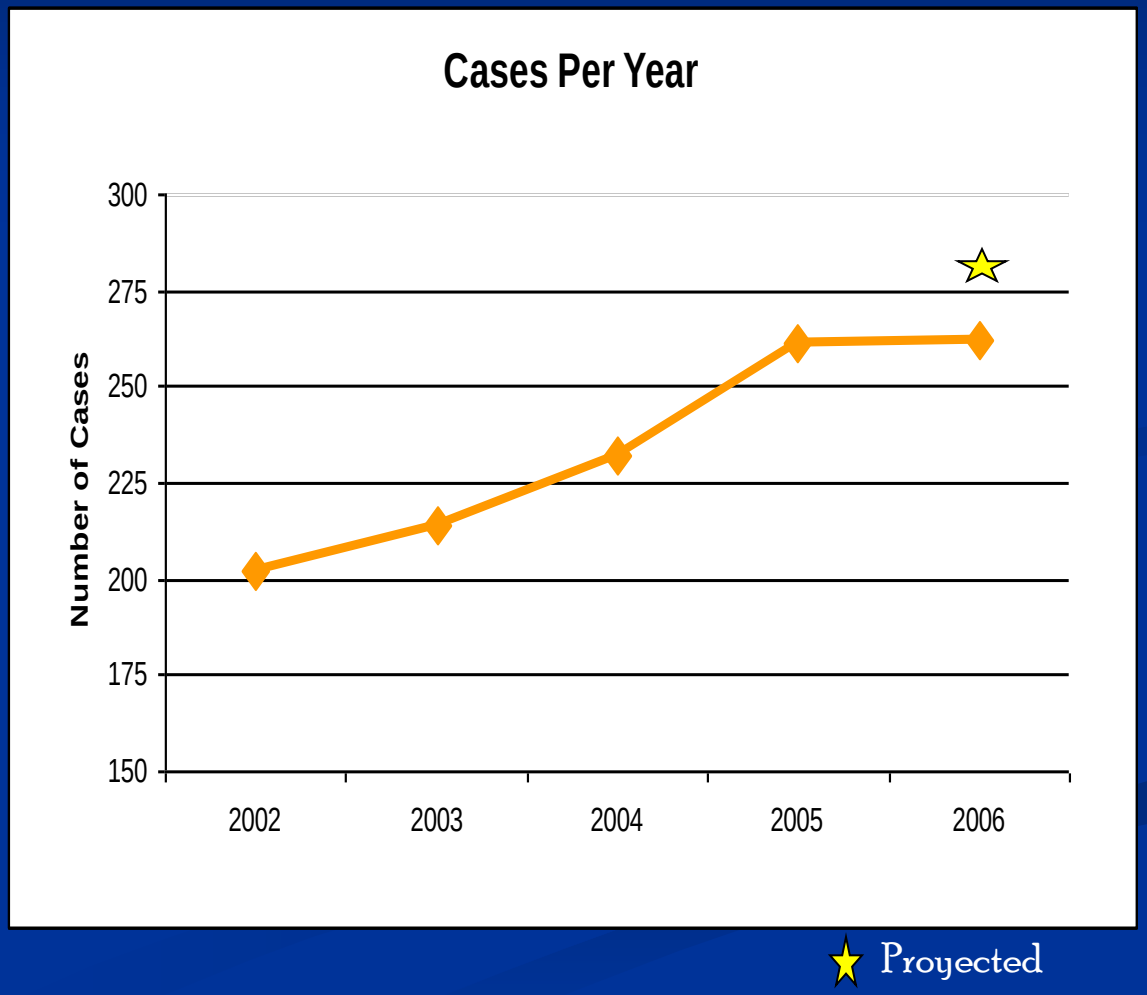
- Retrospective analysis of the surgical procedures for adult Central Nervous System tumors in Puerto Rico from January 1st 2002 through May 31, 2006.
- For cases performed on University of Puerto Rico (UPR), the Neurosurgery Department database was analyzed.
- For cases outside the UPR, neurosurgeons throughout Puerto Rico were contacted by phone or personally. They provided the list of their cases and each medical record was reviewed individually.
- Data from more than 90 percent of Neurosurgeons in Puerto Rico was available for the study.

Methods

- Each case required an official pathological report
- From each medical record the following information was collected:
  - Age and gender
  - Location of lesion
  - Operative procedure
  - Histological diagnosis
- Recurrent lesions were excluded

Results

- A total of 1,018 procedures were performed in 1,005 patients*
- Mean: 234 cases/year

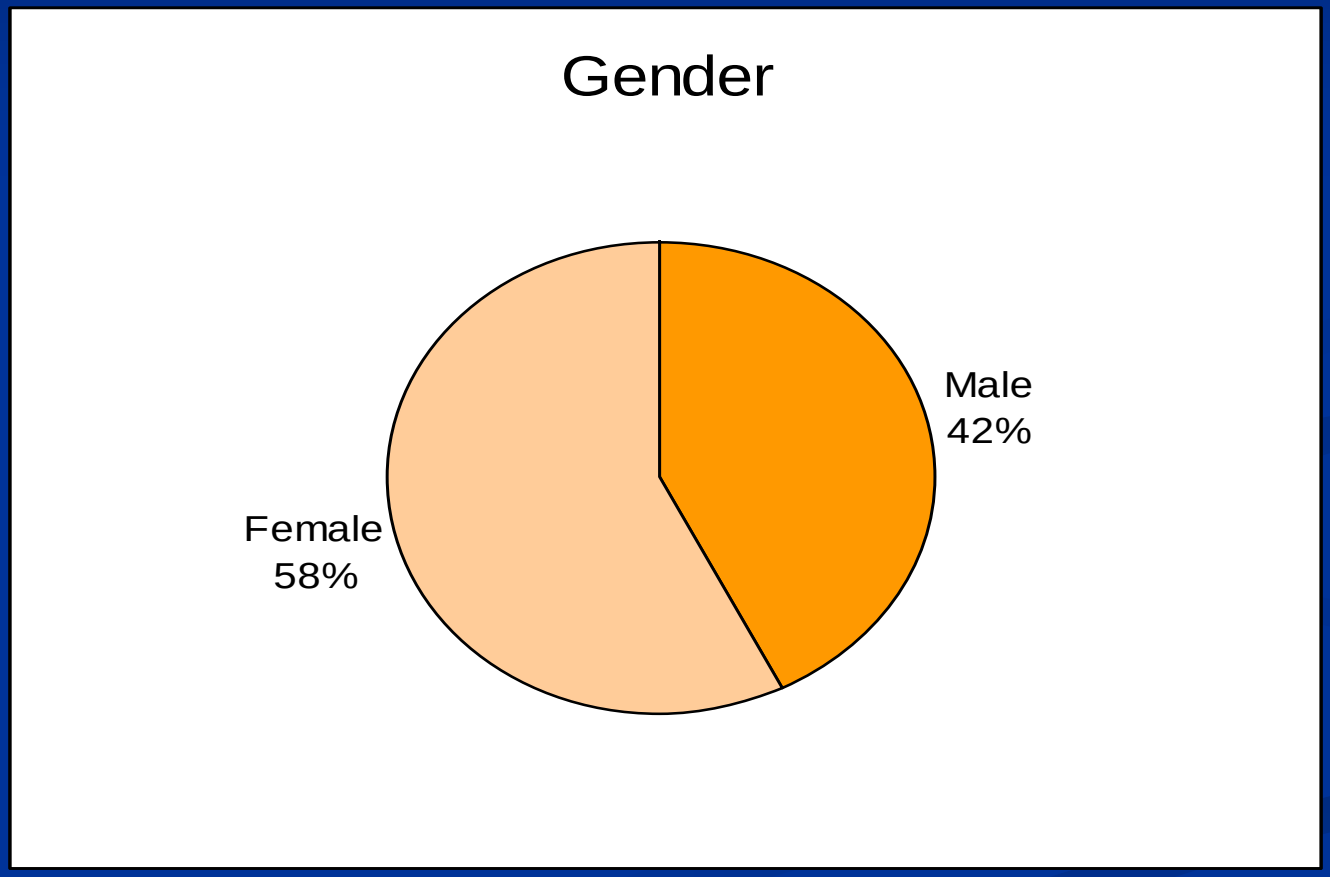


* A total of 9 patients underwent two or more procedures

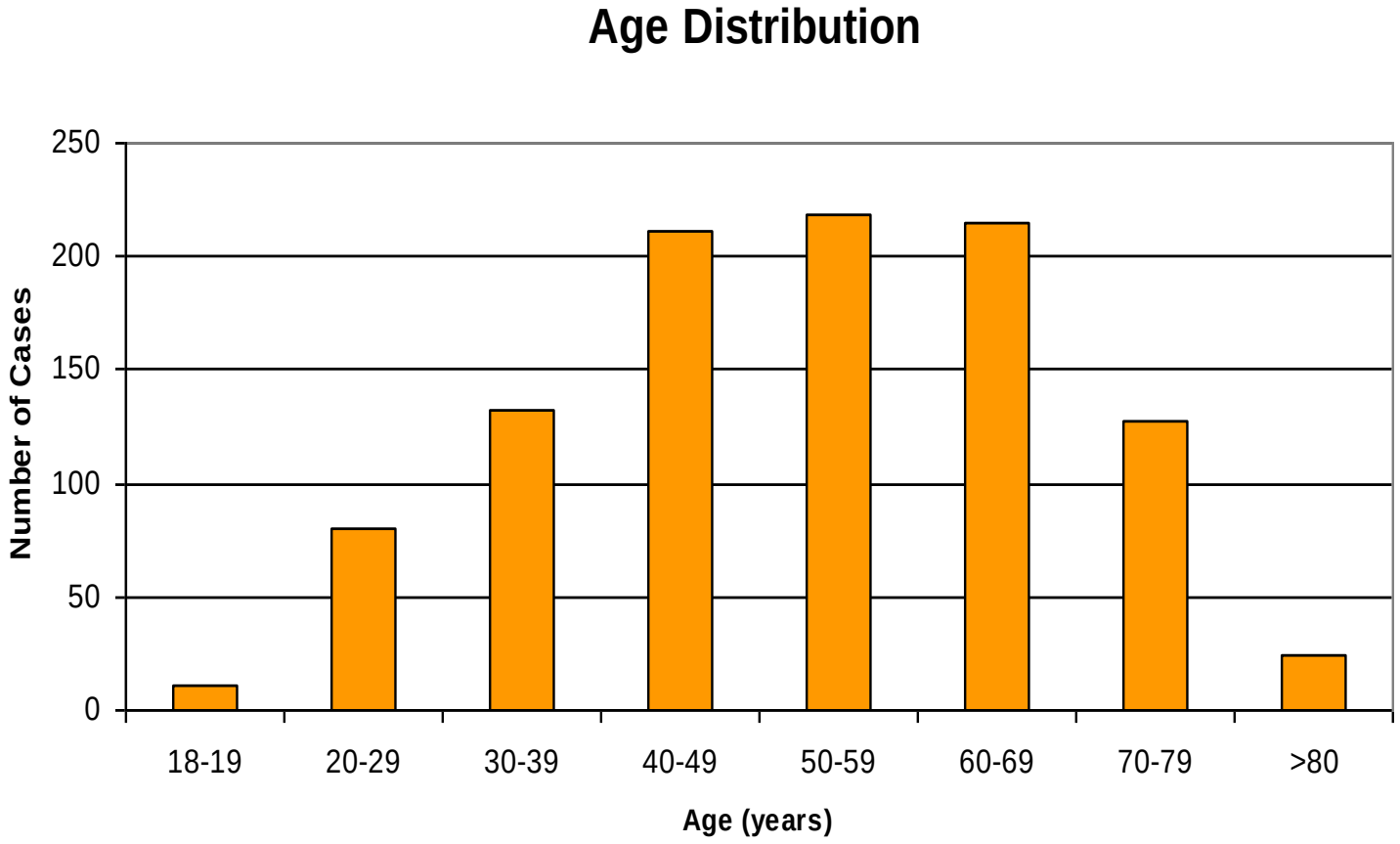
Hospitals

Hospitals	Number of Cases (%)
University of Puerto Rico	601 (59%)
Other Hospitals	417 (41%)
Total	**1,018**

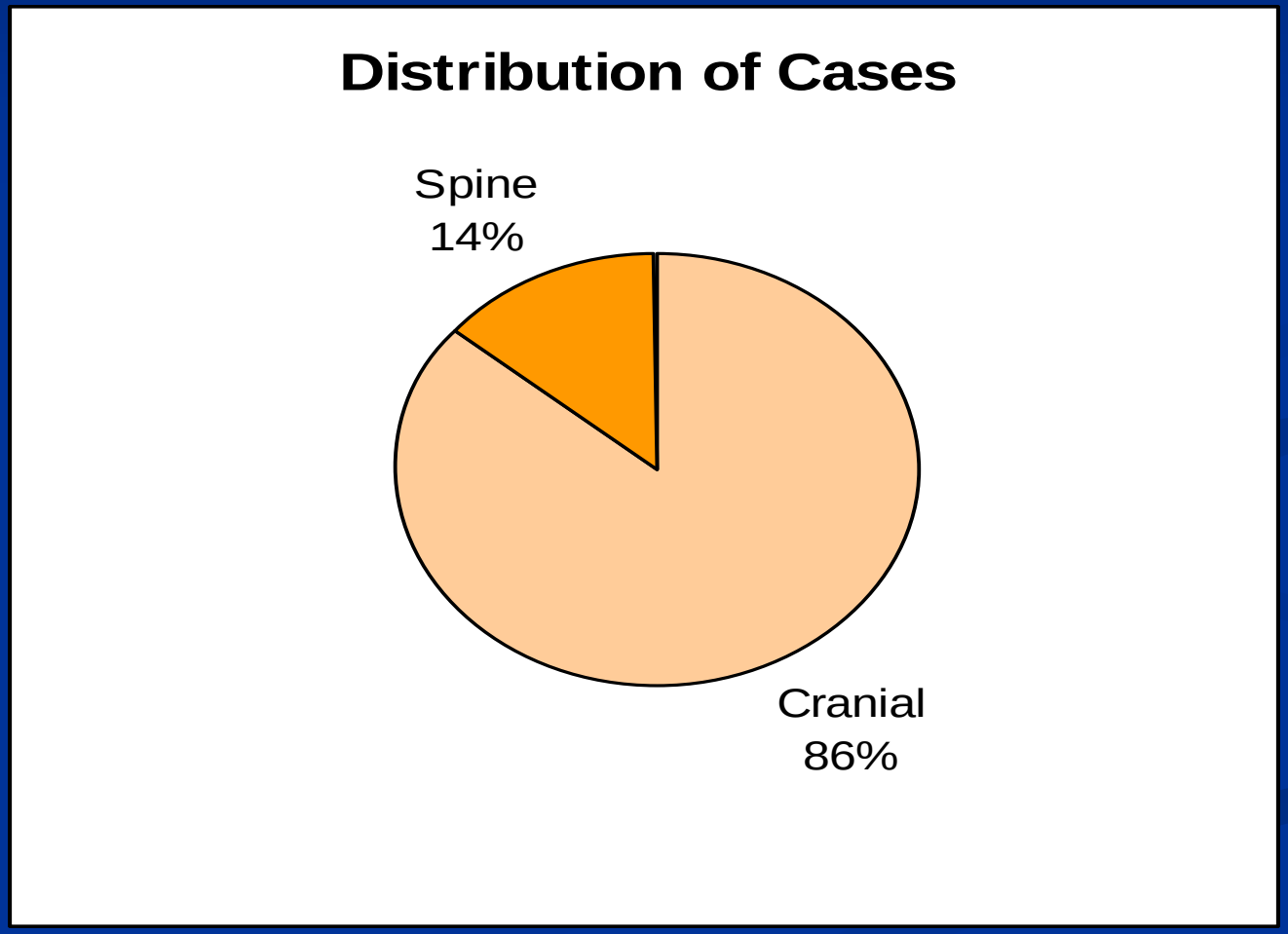
Results:
Distribution by Gender



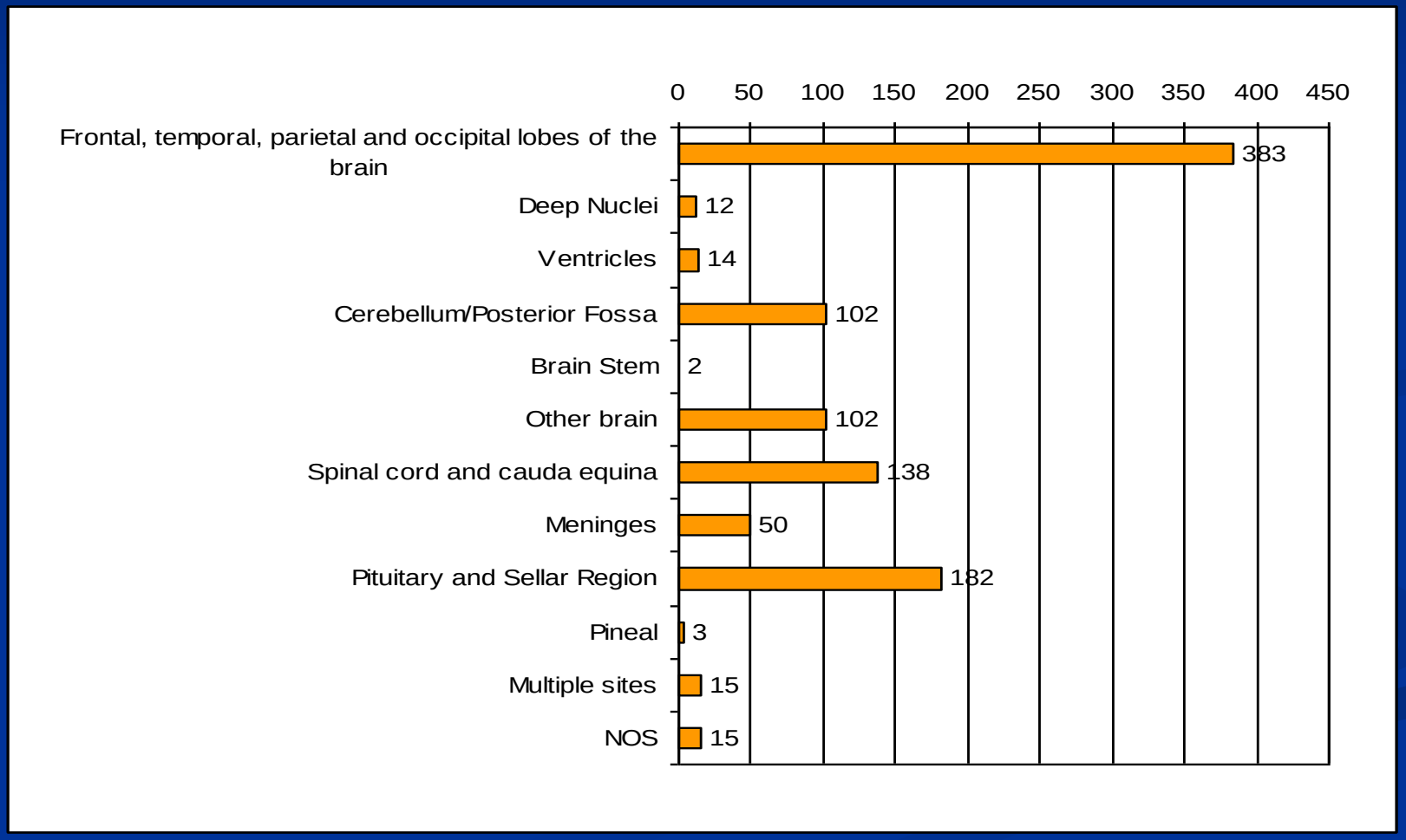
Results: Distribution by Age



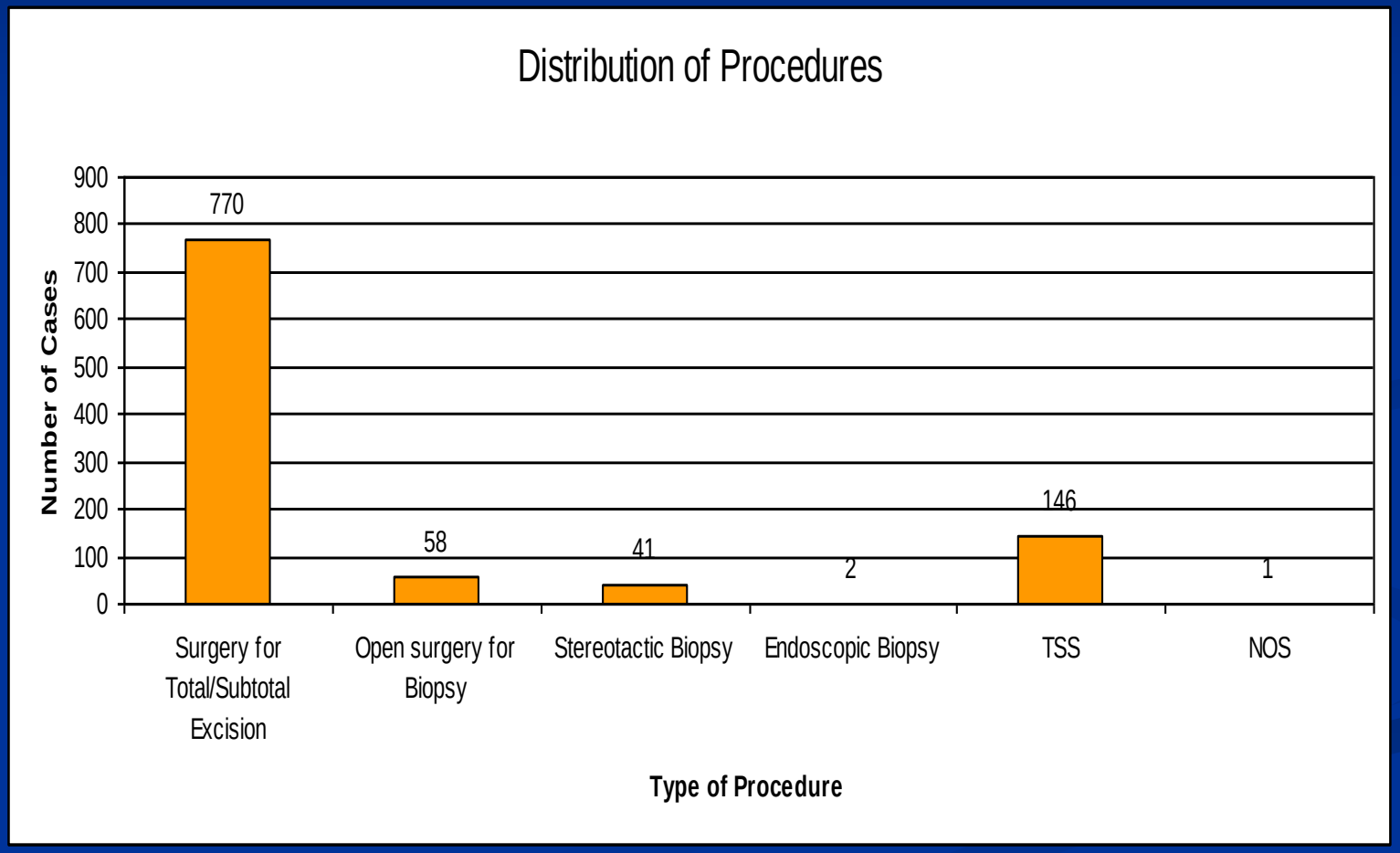
Results:
Distribution by Location



Results:
Distribution by Location



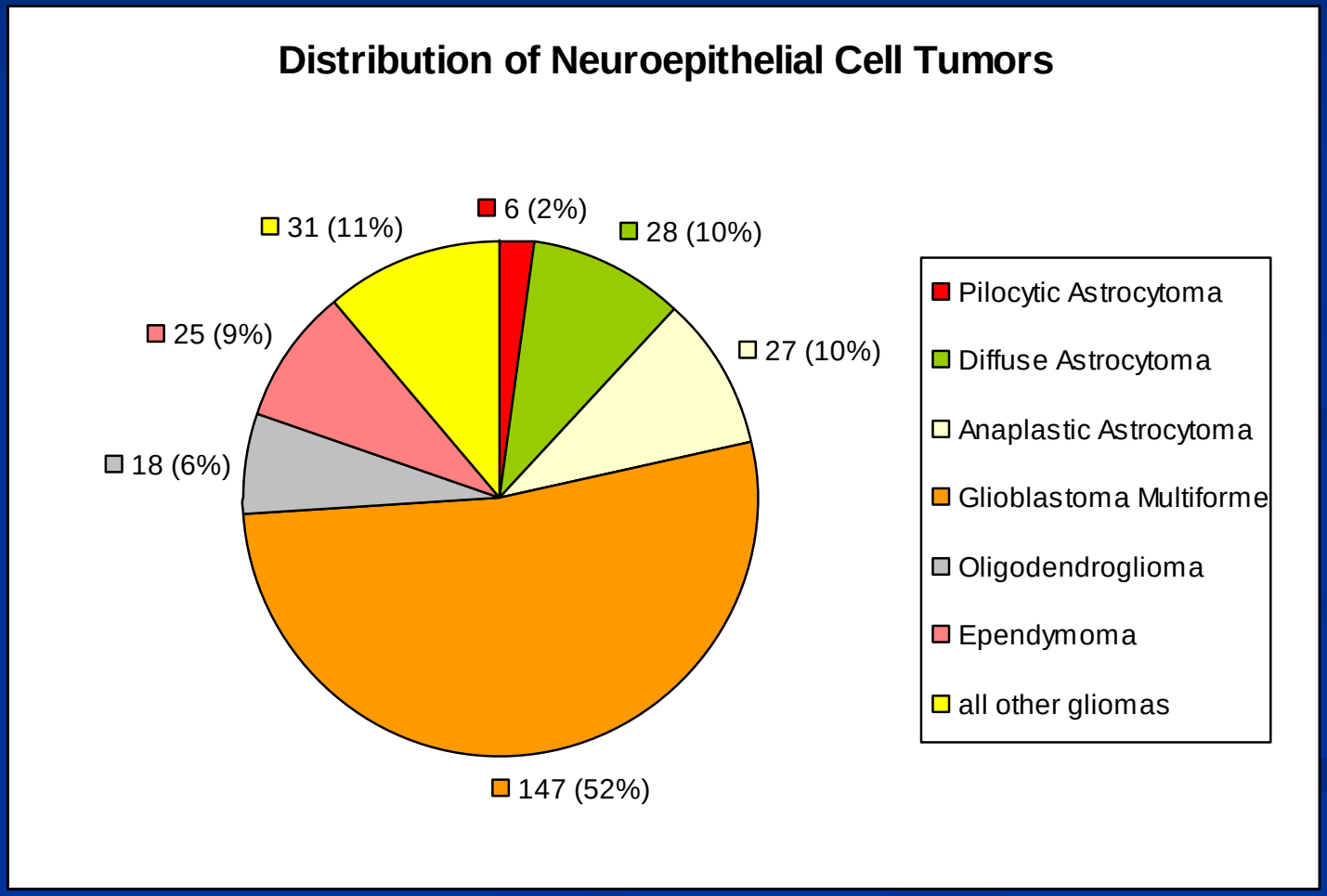
Results: Surgical Procedures



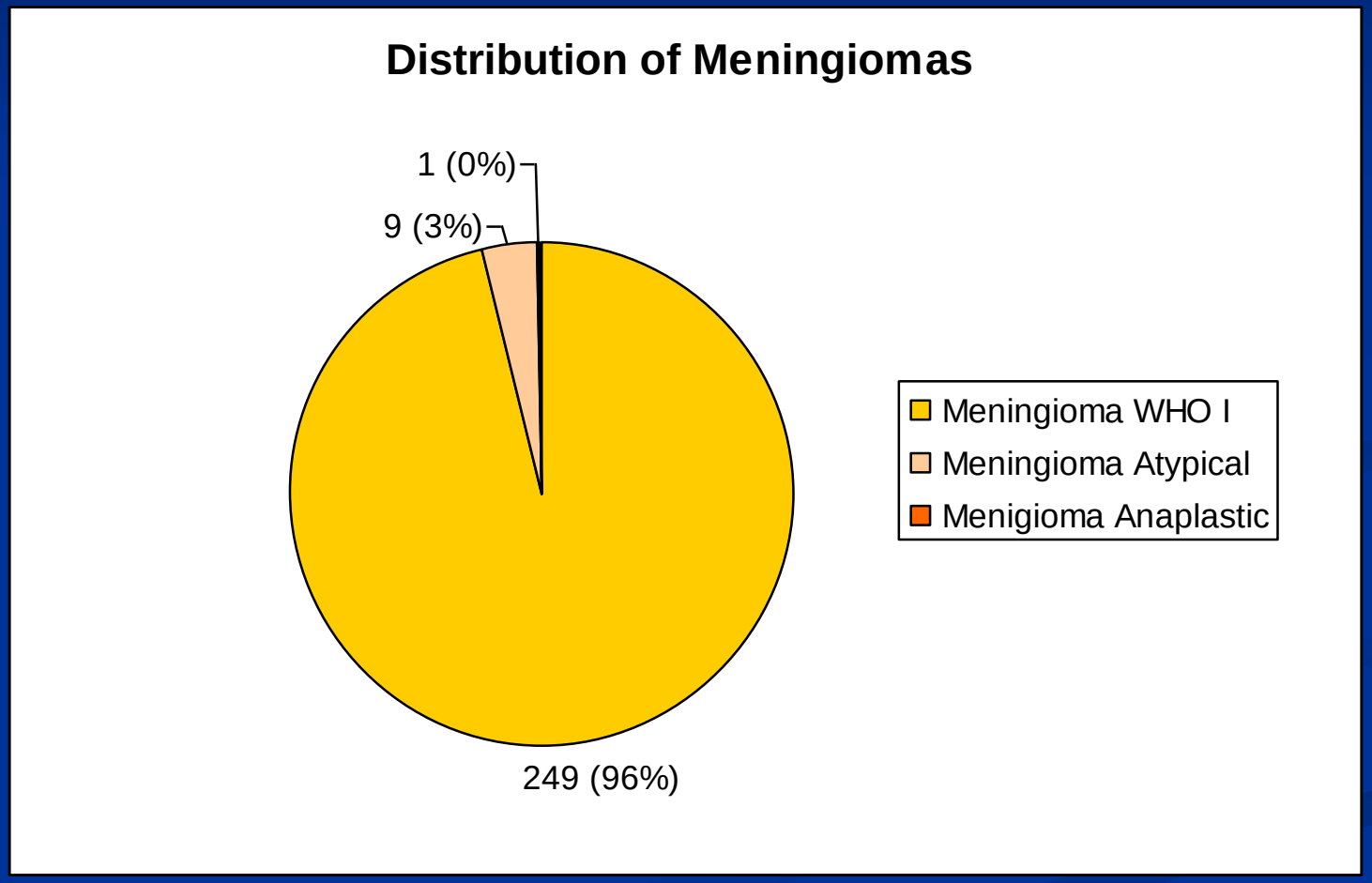
Results: Major Histological Groups

Histological Groups	Number of Cases (%)
Primary	**901 (88.5)**
Neuroepithelial cell tumors	282
Meningiomas	259
Pituitary adenomas	161
Cranial /spinal nerve tumors	88
Lymphomas and hematopoietic tumors	40
Other	71
Secondary	
Metastasis	**117 (11.5)**
Total	**1,018**

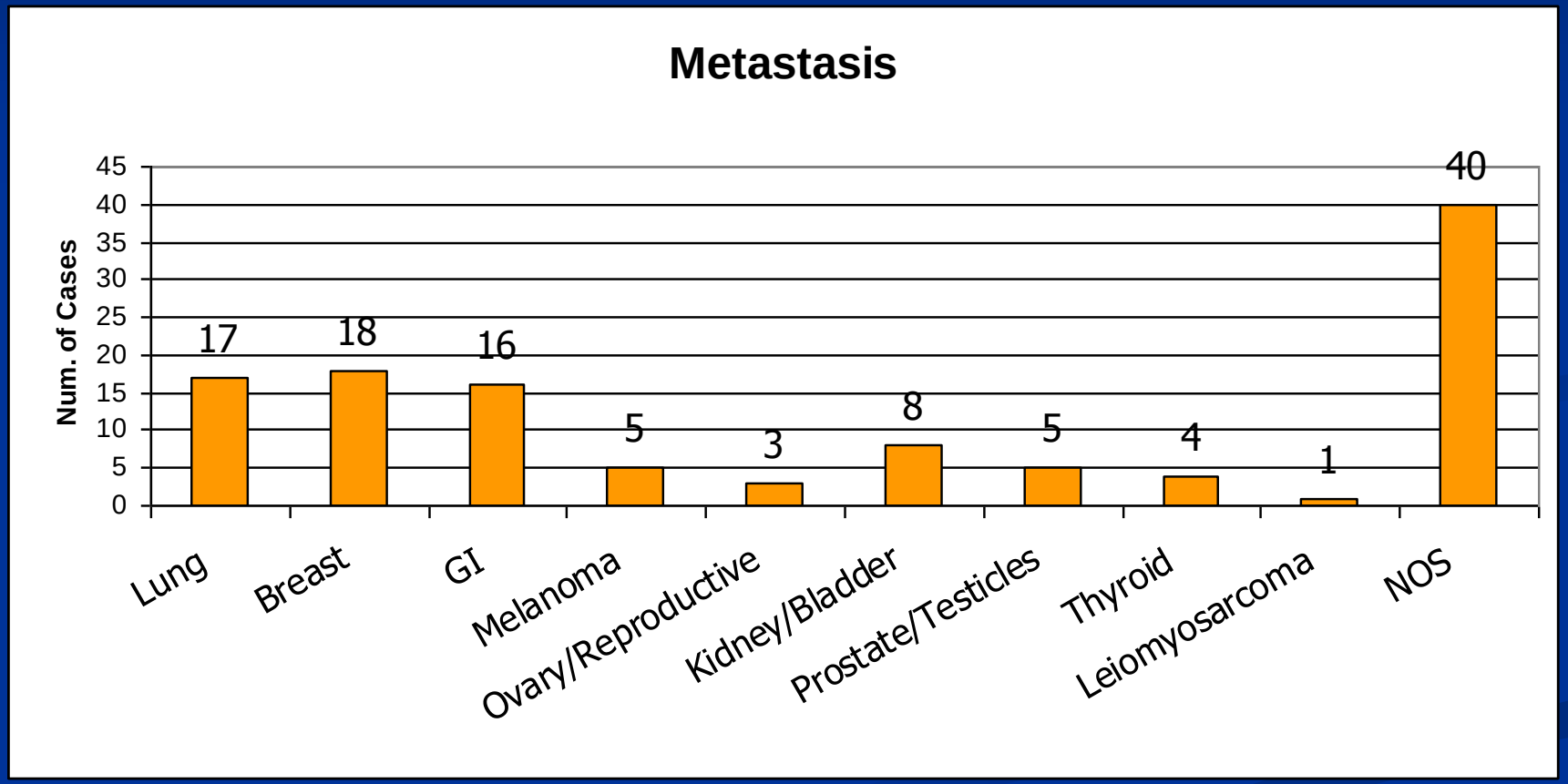
Results: Neuroepithelial Cell Tumors



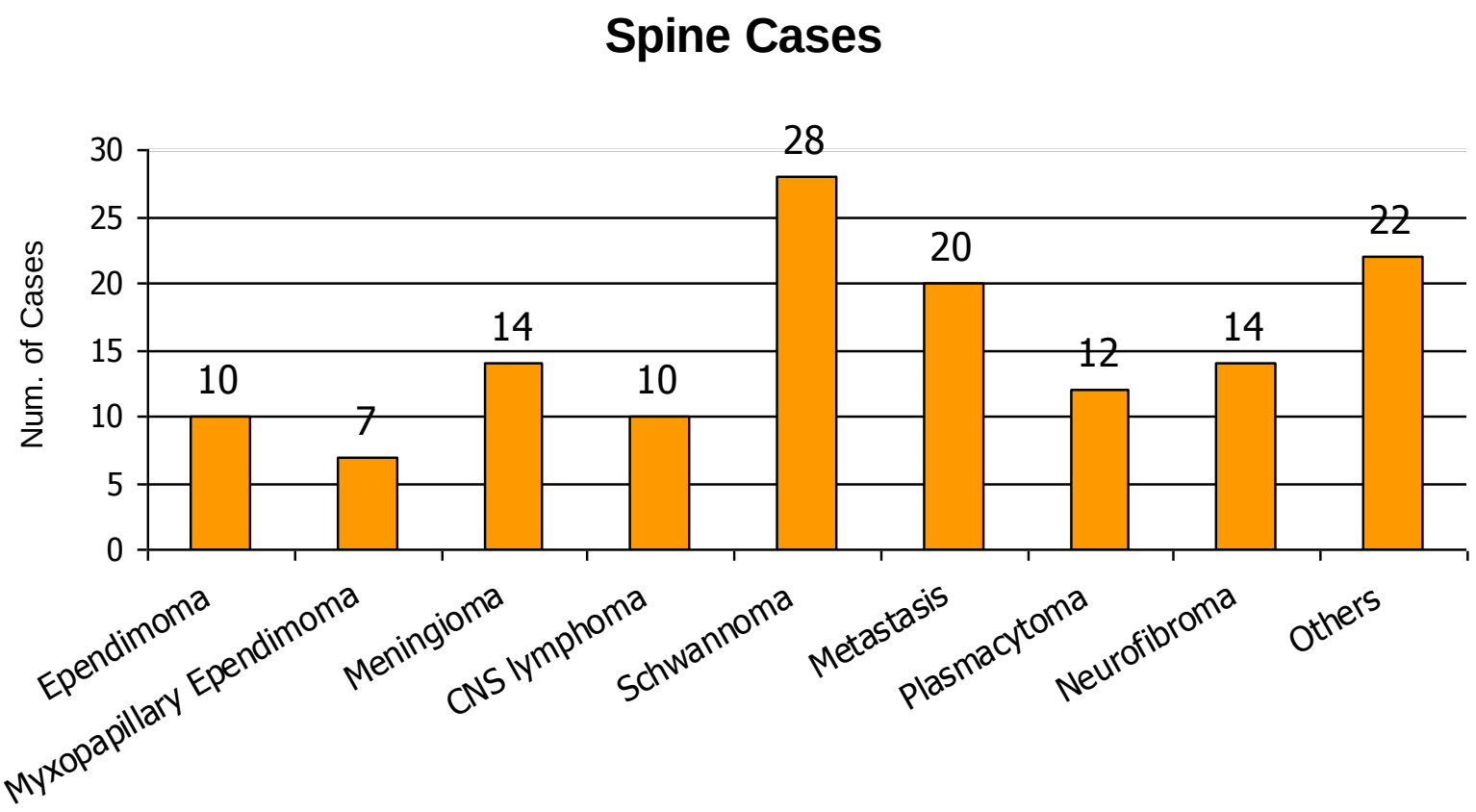
Results:


Distribution of Meningiomas
1 (0%)
9 (3%)
249 (96%)
Meningioma WHO I
Meningioma Atypical
Menigioma Anaplastic

Results:
Source of the CNS Metastasis



Spine Cases


Spine Cases
Num. of Cases
30
25
20
15
10
5
0
10
7
14
10
28
20
12
14
22
Ependimoma
Myxopapillary Ependimoma
Meningioma
CNS lymphoma
Schwannoma
Metastasis
Plasmacytoma
Neurofibroma
Others

Brain Tumors PR vs. USA

Table 9. Distribution of All Primary CNS Tumors by Histology in Comparison to CBTRUS (2005-2006)* ^

Histology	Our study (%)	CBTRUS (%)
Glioblastoma	16.3	20.3
Other astrocytomas	7.7	9.8
Ependymoma	2.8	2.3
Embryonal	0.7	1.7
Meningioma	28.7	30.1
Pituitary adenoma	17.9	6.3
Craniopharyngioma	1.1	0.7
Nerve Sheath	9.8	8.0
Lymphoma	2.4	3.1
All Other	12.6	13.9

* CBTRUS: Central Brain Tumor Registry of the United States.
^ See Reference 8

Conclusions

- A total of 6.7 per 100,000 people in Puerto Rico underwent surgery for a CNS tumor during January 1, 2002 through May 31, 2006.
- Primary tumors were more frequently operated than metastatic tumors.
- Benign histological tumors were more common than more malignant variants.
- The most common histological type found was Meningioma WHO I, followed by Pituitary Adenomas and Glioblastoma Multiforme.

Pediatric Brain Tumors in Puerto Rico

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Objective: To determine the frequency of pediatric brain tumors treated at the University Pediatric Hospital of Puerto Rico over a 6-year period and examine the demographic data and tumor histology of patients in different age groups.

Methods: A retrospective study was undertaken at the University Pediatric Hospital. We included patients with brain tumors that had been newly diagnosed during the period covering from January 2002 to December 2007. All cases were analyzed by age, gender, histologic diagnosis, and affected area.

Results: One hundred thirty-six patients were included in the study. Overall, males were more frequently affected than were females. Children in the 1 to 4 years old age group had the highest number of newly diagnosed brain tumors. Regarding anatomic location, supratentorial tumors were more frequent than were infratentorial tumors. The most common single tumor was the pilocytic astrocytoma (WHO grade I), representing 31% of the total pediatric brain tumors.

Conclusion: Our results provide an objective platform for further epidemiological studies and for the development of local health strategies for the timely diagnosis and treatment of the most common pediatric tumors in Puerto Rico. [*P R Health Sci J 2011;30:195-197*]

Key words: Pediatric, Brain Tumors, Hispanic

Variable		N (%)
Sex	Male	71 (55)
	Female	57 (45)
Age	<1 year old	6 (4)
	1 - 4	40 (29)
	5 - 9	34 (25)
	10 - 14	30 (22)
	15 - 17	26 (19)

Table 2. Tumor histology of pediatric patients with brain tumors (n=136)

Tumor	N
Pilocytic astrocytoma (WHO grade I)	42
Medulloblastoma	12
Ependymoma (WHO grades I , II, III)	11
Astrocytoma (WHO grade II)	11
Craniopharyngioma	11
Astrocytoma (WHO (grades III & IV)	6
Choroid plexus papilloma (WHO grade I)	5
Germinoma	5
PNET	5
Dermoid cyst	4
SEGA (WHO grade I)	4
Meningioma	3
Ganglioglioma (WHO grade I)	2
Metastatic	2
Oligodendroglioma (WHO grade II)	3
Choroid plexus carcinoma (WHO grade III)	1
Epidermoid cyst	1
Hemangiopericytoma	1
Pilomyxoid astrocytoma	1
Pineocytoma (WHO grade II)	1
Pleomorphic xanthoastrocytoma	2
Rathke's cleft cyst	1
Schwannoma (WHO grade I)	1
Pituitary adenoma	1

Table 3. Histology of the most common tumors by anatomic location

Supratentorial = 77 (57%)	**Infratentorial = 59 (43%)**
Pilocytic astrocytoma: 16%	Pilocytic astrocytoma: 50%
Astrocytoma (WHO grade II): 14%	Medulloblastoma: 20%
Craniopharyngioma:14%	Ependymoma: 12%
Other: 56%	Other: 18%

Radiosurgery

- First Radiosurgery Program started on 1999 at Clínica Las Américas.
- LINAC Based System (BrainLab)
- 1,173 treated patients (1999-2018)

Stereotactic Radiosurgery for Intracranial Tumors: Puerto Rico Experience

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Historically, the treatment for most intracranial pathologies has included medical management, surgery, radiotherapy and recently, stereotactic radiosurgery. Since its introduction, stereotactic radiosurgery has evolved from an investigational concept into a recognized neurosurgical procedure for the management of a wide variety of brain disorders. The goal of this research was to describe the experience in Puerto Rico using this technology and review the efficacy, safety, and role of radiosurgery in the treatment of the most common intracranial tumors treated today. Patients treated from 1999-2009 at Clínicas Las Américas were reviewed and medical literature databases were searched for articles pertaining to stereotactic radiosurgery performed in these intracranial tumor pathologies: meningiomas, gliomas, cerebral metastasis, vestibular schwannomas and pituitary adenomas. Each study was examined to determine the radiosurgical parameters, duration of follow-up review, tumor growth control rate and complications. A total of 50 peer-reviewed studies were examined. Radiosurgery in benign tumors resulted in the control of tumor size in 90% of treated patients. Unfortunately radiosurgery for malignant tumors is not curative, but has been effective in improving survival and quality of life. Although microsurgery remains the primary treatment modality in most cases, stereotactic radiosurgery offers both safe and effective treatment for much intracranial pathologies. Further refinements in the radiosurgical technique will likely lead to improved outcomes and make it a standard of care. [*P R Health Sci J 2010;3:286-292*]

Key words: Stereotactic radiosurgery, Intracranial tumors, Linear accelerator, Gamma Knife Surgery

Table 1. Cumulative indications treated at Clinicas Las Americas in San Juan, P.R. (1999-2009).

Benign Tumors	
Vestibular Schwanomma	78
Tigeminal Schwanomma	6
Other Schwanomma	5
Gliomas Grade I	6
Meningioma	169
Pituitary Adenoma (Secreting)	25
Pituitary Adenoma (Non-Secreting)	42
Pineal Region Tumor	1
Hemangioblastoma	2
Craniopharyngioma	1
Glomus Tumor	5
Other Benign Tumors	43
Total	**383**
Malignant Tumors	
Malignant Glial Tumor (II, III, IV)	60
Metastatic Tumor	192
Oligodendriogliomas	5
Hemangiopericytoma	1
Other Malignant Tumors	16
Total	274
Total Tumors	**657**

Radiosurgery (1999-2018) n=1,173

Dx	No.	%
Metastasis	285	24.3
Meningiomas	257	21.9
Acoustic Schwannoma	174	14.8
Pituitary Tumors	94	8.0
GBM	57	4.9
Other Diagnosis	86	7.3
AVM	115	9.8
Trigeminal Neuralgia	105	9.0

Thank you!