Yield and Complications of Frame-Based and Frameless Stereotactic Brain Biopsy

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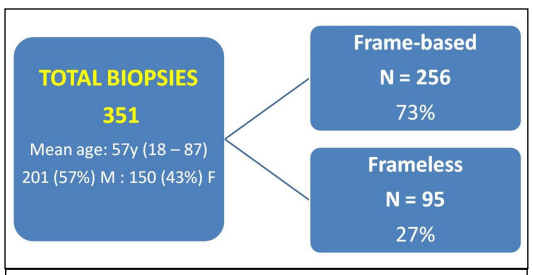
Objectives

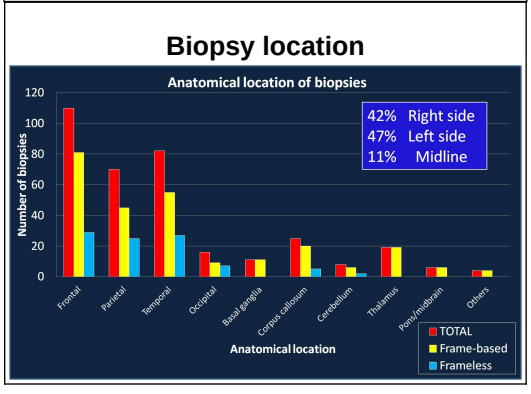
Image-guided stereotactic brain biopsy is an established method to obtain histopathological diagnosis and guide management for cerebral lesions. Evaluation of biopsy methods and associated risks is essential. The study aimed firstly to establish negative biopsy and symptomatic hemorrhage rates at a single center, and secondly to assess the influence of factors such as lesion location, final pathology and the use of intra-operative smears.

Methods

A retrospective analysis of case notes, theatre records and radiological imaging of all frame-based and frameless stereotactic biopsies was carried out over 57 months from July 2006 to March 2011.

Demographics and biopsy location





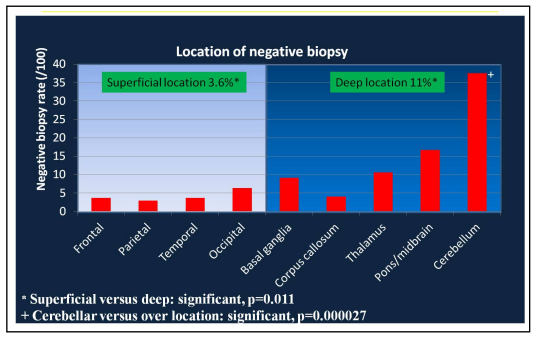
Results

Pathology

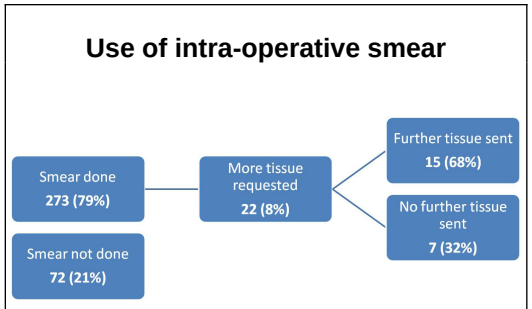
Pathology	Number	Percentage
Grade IV	173	49
Grade III	36	10
Grade II	50	14
Grade I	2	1
Lymphoma	32	9
Metastasis	13	4
Abscess	13	4
Other	9	3
Ungraded/unknown	5	1
Negative biopsy	**18**	**5**

Negative biopsy rate 5.1%

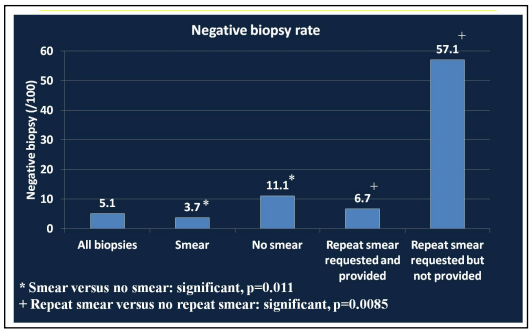
There was a significantly greater negative biopsy rate in deep brain biopsies (p=0.011) and in the cerebellum (p<0.001) versus biopsies in other anatomical locations.



Use of intra-operative smear



Intra-operative smear significantly reduced negative biopsy rates from 11.1% to 3.6% (p=0.011). If repeat smear was requested yet not provided then the negative biopsy rate was 57.1% (p=0.0085).



Symptomatic hemorrhage rate 3.7%

There was a significant increase in hemorrhage rate in deep versus superficial biopsies (p=0.023) and a significantly greater hemorrhage rate in lymphoma biopsies versus other pathologies (p=0.015). There was no significant increase in hemorrhage rate in high grade compared to low grade tumor biopsies.

Symptomatic hemorrhage rate	Rate	
Overall	**3.7%**	
Haemorrhage causing persistent deficit	**2.8%**	
Deep location	13.6%	p=0.023*
Superficial location	3.1%	
High grade lesion	4.8%	p=0.35
Low grade lesion	2.3%	
Lymphoma	12.5%	p=0.015*
Non-lymphoma	3.4%	

Conclusion

- **Intra-operative smear significantly reduces negative biopsy rates**
- **Cerebellum and deep seated biopsies have increased negative biopsy rates**
- **Symptomtic haemorrhage rates are significantly greater in deep seated lesions and in biopsies of lymphoma.**

Review of the literature

A review of 15,109 biopsies from all studies with over 100 subjects in the English language literature demonstrated an unweighted mean negative biopsy rate of 5.3% (range: 0.7 - 10.6%), morbidity rate of 3.9% (range: 0.7 - 9.6%) and mortality rate of 0.8% (range: 0 - 3.8%). The results presented here compare favourably with these data.

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