# Peritumoral Oedema in Meningioma Surgery – The Role In Peri-Operative Complications

Anthony Charles Amato-Watkins MD; Michael Hollifield MD; Paul Leach; Caroline Hayhurst FRCS

University Hospital of Wales, Cardiff, UK
Department of Neurosurgery

## Introduction

Peri-tumoral brain oedema (PTBE) associated with intracranial meningioma occurs variably. The causal factors and whether the presence of oedema contributes to post-operative complications is not known. We sought to determine correlations between PTBE in patients undergoing craniotomy for meningioma and the impact on post-operative complications.

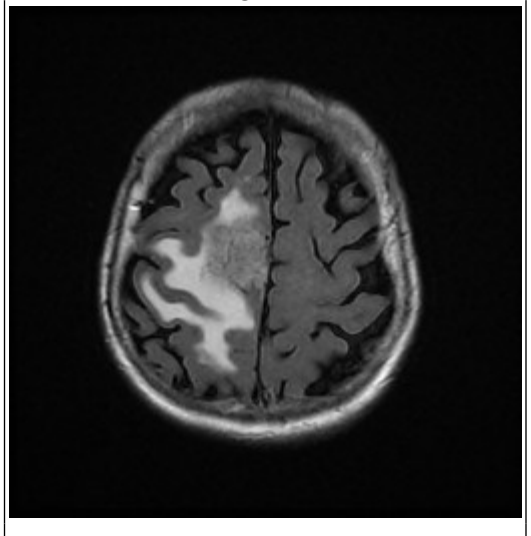
## Methods

Clinical and histological factors were identified by retrospective clinical chart review of a consecutive cohort of adult patients who underwent craniotomy for meningioma in a single institution. Factors included presenting clinical and radiological features, mode of admission and the use of pre-operative corticosteroids, WHO grade and histological subtype. Post-operative complications, including the presence of neurological deficits, seizures and infection were also recorded. Tumour and oedema volume were evaluated using manual segmentation to allow calculation of an oedema index (OI, volume oedema/volume tumor).

## Results

44 patients underwent surgical resection for meningioma from 1st January 2011 to 31st December 2011, including 11 men and 33 women with mean age of 59.9. PTBE was present in 61.4% of patients with a mean OI of 2.29 (range 0-23.3) Age, gender and histological subtype were not correlated with OI or complications. Tumours resected in asymptomatic patients were associated with fewer post-operative complications than patients with pre-operative deficits or seizures (P=0.036). Use of pre-operative corticosteroids led to significantly more post-operative complications (P=0.008), mostly new neurological deficit or CSF leak. Other than tumour size (p=0.02), no other factors such as location or association with venous sinuses correlated with the presence of oedema.

**Figure 1**



peritumoral edema

**Table 1**

Analysis of clinical variables associated with the presence of post-operative complications and the calculated oedema index (OI)

| Clinical Variable | | Total (%) | Complications p | OI p |
|---|---|---|---|---|
| Sex | Male | 11 (25) | 0.634 | 0.158 |
| | Female | 33 (75) | | |
| Age group | 21-40 | 2 (4.5) | 0.649 | 0.341 |
| | 41-50 | 5 (11.4) | | |
| | 51-60 | 19 (43.2) | | |
| | 61-70 | 7 (15.9) | | |
| | >70 | 11 (25) | | |
| Incidental finding | Y | 4 (9.1) | 0.036* | 0.634 |
| | N | 40 (90.9) | | |
| Focal neurological deficit | Y | 28 (63.6) | 0.006 | 0.447 |
| | N | 16 (36.4) | | |
| Seizures | Y | 10 (22.7) | 0.147 | 0.062 |
| | N | 34 (77.3) | | |
| Headaches | Y | 21 (47.7) | 0.249 | 0.583 |
| | N | 23 (52.3) | | |
| Other presenting feature | Y | 7 (15.9) | 0.428 | 0.402 |
| | N | 37 (84.1) | | |
| Mode of presentation | Emergency | 12 (27.3) | 0.295 | 0.09 |
| | Elective | 32 (72.7) | | |
| Pre-operative steroids | Y | 14 (31.8) | 0.008* | 0.184 |
| | N | 30 (68.2) | | |

* P < 0.05

**Table 2**

Post operative complications in patients who received pre-operative corticosteroid therapy

| Complication | Total (%) | | Total (%) |
|---|---|---|---|
| Persisting neurological deficit | 7 (50) | Same as pre-operative deficit | 3 (21.4) |
| | | Different to pre-operative deficit | 3 (7.1) |
| | | No pre-operative deficit | 1 (7.1) |
| | 3 (21.4) | Present pre-operatively | 0 |
| Seizures | | Not present pre-operatively | 3 (21.4) |
| Infection | 1 (7.1) | | |
| CSF fistula | 5 (35.7) | | |
| Death | 1 (7.1) | | |

**Table 3**

Analysis of post-operative variables associated with the oedema index (OI)

| Post-operative Variable | | Total | OI p |
|---|---|---|---|
| Extent of resection | Complete | 33 (75) | 0.338 |
| | Partial | 11 (25) | |
| Overall Complications | Y | 24 (54.5) | 0.164 |
| | N | 20 (45.5) | |
| Persisting neurological deficit | Y | 15 (29.5) | 0.106 |
| | N | 31 (70.5) | |
| Seizures | Y | 4 (9.1) | 0.441 |
| | N | 40 (90.9) | |
| Infection | Y | 5 (11.4) | 0.314 |
| | N | 39 (88.6) | |
| CSF fistula | Y | 10 (77.3) | 0.735 |
| | N | 34 (22.7) | |
| Other | Y | 7 (15.9) | 0.221 |
| | N | 37 (84.1) | |

## Learning Objectives

By the conclusion of this session, participants should be able to discuss the causal factors of oedema associated with intracranial meningiomas and the factors associated with post-operative complications.

## Conclusions

PTBE occurs in a large proportion of patients with meningioma and OI is correlated to tumour size, but no other radiological or histological factor. Although the presence of oedema is not correlated with complications, patients who presented with a neurological deficit or seizures or had corticosteroids prior to surgery were more likely to develop post-operative complications.