Optic Nerve Sheath

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ACKNOWLEDGEMENTS

- Dr. Philippe Rola
- Dr. Christian Otto
- Lead scientist, NASA VIIP Project
DISCLOSURE

- None
OBJECTIVES

• Review the anatomy and physiology of the optic nerve sheath
• Know the role of ultrasonography of the ONS to assess for intracranial pathology
CASES

• 30 yo female morning headaches x 8 months, nausea, tinnitus, CT Head -
• 67 yo male MVC, smells of alcohol, combative, hypotensive, FAST +
• 55 yo female presents with seizure. History of lung cancer.
HISTORY

- Hayreh 1964
  - Constant communication between the
    - Subarachnoid space
    - Optic nerve sheath
    - Intracranial cavity

HISTORY

- Helmke and Hansen 1996
- B-scan to measure ONSD
- 3 mm behind the globe

BENEFITS

• Portable
• Repeatable
• Minutes
• No radiation
• Rural and/or austere environments
WHAT’S THE EVIDENCE

- Duboourg J et al.
  - Meta-analysis
  - 6 studies (236 patients)
  - Pooled sensitivity 90% (95%CI 80-95%)
  - Pooled specificity 85% (95%CI 73-93%)
  - Pooled diagnostic odds ratio 51
    - In patients with elevated ICP, 51 times more likely to have a positive ONSD

TECHNIQUE

• Closed eyelid
• Apply gel
• High frequency transducer
  • 7.5-10 MHz
WHAT’S NORMAL

- Adults < 5 mm normal
- Pediatrics (1-15 yo) <4.5 mm
- Infants < 4mm
- 5.0 – 5.7 mm increased ICP > 20 mm Hg

INTER-OBSERVER RELIABILITY

- 67 normal adult volunteers
- Mean inter observer variation 0.1 mm (95%CI 0-0.4mm)

HOW MANY SCANS?

• Experience sonographer
  • 10 scans with 3 abnormal

• Novice sonographer
  • 25 scans

IS IT SAFE?

• Minimize scan times
  • less than 5 minutes
• No doppler
• ALARA
• FDA/Health Canada
  • MI 0.23  TI<1.0

CASE

• 30 yo female morning headaches x 8 months, nausea, tinnitus

• CT Head -
PAPILLEDEMA

- Late sign of increased ICP
- Asymmetric
- Anatomical differences
- Stereoscopic imaging, dilated eyes
  - Sensitivity 84.5%
  - Specificity 59.3%

CASE

- 67 yo male MVC, smells of alcohol, combative, hypotensive, FAST +
CASE

- 55 yo female presents with seizure.
- History of lung cancer.
CAUSES OF INCREASED ONSD

- Without elevated ICP
  - Optic neuritis
  - Arachnoid cyst of the optic nerve
  - Optic nerve trauma
  - Anterior orbital or cavernous sinus mass

CAUSES OF INCREASED ONSD

• With elevated ICP
  • Tumour or space-occupying lesion
  • Idiopathic intracranial hypertension
  • Decreased CSF resorption (eg. venous sinus thrombosis, SAH, meningitis)
  • Increased CSF production (tumours)
  • Obstruction of the ventricular system
  • Cerebral edema, encephalitis
  • Craniosynostosis

Christian and Eric Otto of the Canadian Mt. Everest Medical Operations Expedition have successfully summited Mount Everest!

[Image of climbers with a Canadian flag]

Latest Updates

Tuesday May 27, 2008
Day 57 CSA-Everest Operational Space Medicine Project (Dispatch)

Sunday May 25, 2008
Day 55 Descending to Base Camp (Dispatch)

Saturday May 24, 2008
Day 54 Descending to Camp II (Dispatch)
IN FLIGHT B-SCAN ULTRASOUND
OBJECTIVES

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