Cerebral Venous Thrombosis: Management Strategies And When To Treat Interventionally

Italo Linfante MD, FAHA
Director
Endovascular Neurosurgery
Associate Professor
Neurology, Neurosurgery and Radiology

Disclosures

Medtronic/Covidien: Consultant, Speaker, Proctor for Pipeline and Barrel
Stryker: Consultant, Speaker
Penumbra: Consultant
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INR MCVI

Dr. Guilherme Dabus
Dr. Andrey Lima
Cerebral Venous Thrombosis (CVT)

- 0.5-1% of all strokes
- Incidence: 12.3 per million; 5% of all ICH
- 624 cases of the International Study of Cerebral Venous and Dural Sinuses Thrombosis (ISCVT) shows that 78% was in <50 years-old

PATHOPHYSIOLOGY

Virchow’s Triad

- Hypercoagulability
- Changes in vessel wall
- Changes in blood flow/volume

Stasis  Venous Thrombosis  Hemorrhagic & Ischemic Infarcts

CAUSES OF CVT

INFECTIOUS
- Intracranial infections (meningitis, empyemas, abscess)
- Paracranial infections (face/scalp, paranasal sinuses, mastoids, dental)
- Systemic infections (sepsis, endocarditis)

NON-INFECTION
- Pregnancy/puerperium
- Trauma
- Compression of IJV
- Dural AVM
- Post-surgery/spinal procedures
- Tumors (systemic or intracranial)
- SLE diseases (Lupus, SLE, Roth’s, dermatomyositis)
- Inflammatory (sarcoidosis, Wegener’s, temporal arteritis)
- Hematological diseases (polycythemia, PNH, sickle cell, thrombocytopenia)
- Neoplastic syndromes
- Coagulation disorders (inherited or acquired)
- Volume depletion (blood loss, dehydration)
- Medications (OC, hormonal therapy, L-asparaginase, steroids)
Symptoms

- Headaches
- Seizures
- Impaired High Cortical Functions
- Focal Neurological Deficits
- Decreased Level of Consciousness
- Coma
- Death

IMAGING

- Imaging can establish the diagnosis of CVT
- MRI: Brain parenchyma; veins
- CT when MRI not available
- Imaging of the venous sinuses → MRV, CTV or DSA
### Treatment

### Levels of Evidence

- Evidence-based
- Eminence-based
- Eloquence-based
- Elegance-based
- Vehemence-based

### Class and Level of Evidence

**Class I**
Conditions for which there is evidence for and/or general agreement that the procedure or treatment is useful and effective

**Class II**
Conditions for which there is conflicting evidence and/or a divergence of opinion about the usefulness/efficacy of a procedure or treatment

**Class IIIa**
The weight of evidence or opinion is in favor of the procedure or treatment.

**Class IIIb**
Usefulness/efficacy is less well established by evidence or opinion.

**Class III**
Conditions for which there is evidence and/or general agreement that the procedure or treatment is not useful/ effective and in some cases may be harmful

**Level of evidence**
- Level A: Data derived from multiple randomized clinical trials
- Level B: Data derived from a single randomized trial or nonrandomized studies
- Level C: Consensus opinion of experts
Diagnosis and Management of Cerebral Venous Thrombosis:
A Statement for Healthcare Professional from the American Heart Association/American Stroke Association

Saposnik G et al
Stroke 2011;42:1158-1192

Heparin: The Trials

- Einhaup KM et al Lancet 1991
- UFH (3000 bolus + infusion) compared to Placebo
- Planned 60 patients stopped at 20
- Placebo: 3 died, 6 minor deficits, 1 recovered
- Heparin: 8 recovered, 2 minor deficits

Heparin: The Trials

- De Bruijn et al Stroke 1999
- 59 patients
- sc nandroparin body weight vs placebo
- Poor outcome at 3 months: 13 % nandroparin; 21% placebo
Heparin:
Retrospective analyses

- 102 p: 63% with IV heparin 4% died and 52% complete recovery
- No treatment: 69% mortality; 3% good outcome
- Largest case series: 624 CVT p all with heparin: Mortality 8.3%
- 79% mRS 0-1; 10.4% mRS 2-3; 2.2% >4

Endovascular Therapy

- Meta analysis of retrospective multicenter US registries
- 182 CVT; only 15% treated with local intraclot tPA after failed medical management (IV heparin)
- Recanalization in 96%

Endovascular Therapy


- 72 studies 169 patients
- Urokinase most frequently administered (76%) locally infused in the occluded sinus
- 88% good outcome
- 7% dependent; 5% died
- Intracranial haemorrhages 17% of cases (5% with clinical deterioration)
- Extracranial haemorrhages occurred in 21%, only 2% required blood transfusion
Endovascular Therapy

- Anecdotal evidence with Mechanical Thrombectomy
  - Angiojet
  - Concentric
  - Penumbra
  - Angioplasty and Stenting

Recommendations

- Admission to a stroke unit is reasonable for treatment and for prevention of clinical complications of patients with CVT (Class IIa; Level of Evidence C).

- In patients with CVT and increased intracranial pressure, acetazolamide, lumbar puncture, optic nerve decompression, or shunts or decompressive hemicraniectomy can be effective (Class IIa; Level of Evidence C).
Recommendations

- For patients with CVT, initial anticoagulation with adjusted-dose UFH or weight-based LMWH in full anticoagulant doses is reasonable, regardless of the presence of ICH (Class Iia; Level of Evidence B).

- Endovascular intervention may be considered if deterioration occurs despite intensive anticoagulation treatment (Class Ib; Level of Evidence C).

Proposed Algorithm for the Management of CVT

Patient

- 40 year old woman with persistent headaches for approximately one week
- She then developed a left hominous hemianopsia
- CT and MRI/MRV: right transverse sinus and jugular vein thrombosis
- Started on IV heparin, PTT 80-100
- On day 4 she developed GTC and decrease responsiveness. Intubated
Clot formation in the transverse and straight sinus
Thrombectomy followed by thrombo-aspiration with complete
Reperfusion also of the sigmoid sinus and jugular vein

Late phase right ICA Angiogram
and lateral

Patient

- Extubated the day after
- Does very well post procedure
- Left HH improved significantly
- Develops a “foreign accent syndrome”
  (Dutch/German)
Patient

- 26 year old post-partum with severe headaches
- She quickly developed altered mental status
- CT and MRI/MRV shows left transverse sinus and jugular vein thrombosis
- Does not improve on IV heparin
- Taken to the angio-room
Suspect CVT in women with neurological symptoms during pregnancy/ puerperium, in patients with “benign” intracranial HTN, & in cases of unexplained ICH

Medical Management preferably in stroke units according to published guidelines

IV heparin or heparinoids first line

Otherwise, endovascular therapy is safe and effective

With treatment we can expect good outcomes and 2-5 % mortality