DMS-2760: TRANSCRANIAL DOPPLER SONOGRAPHY

Cuyahoga Community College

Viewing: DMS-2760 : Transcranial Doppler Sonography

Board of Trustees:
May 2020

Academic Term:
Fall 2020

Subject Code
DMS - Diagnostic Medical Sonography

Course Number:
2760

Title:
Transcranial Doppler Sonography

Catalog Description:
Specialized advance study of intracranial circulation using Transcranial Doppler (TCD) and Transcranial Duplex Imaging (TCI). Focus on anatomy, pathology, applications of TCD/TCI, sonographic scanning technique and interpretation of TCD and TCI.

Credit Hour(s):
1

Lecture Hour(s):
.5

Lab Hour(s):
1.5

Requisites

Prerequisite and Corequisite
DMS-2301 Intermediate Sonographic Scanning, or concurrent enrollment.

Outcomes

Course Outcome(s):
Examine and interpret the factors associated with intracerebral circulation for normal, abnormal, and diseased vessels using TCD and TCI.

Objective(s):
1. Identify the vessels associated with intracerebral circulation.
2. Identify the common anatomical variants of intracerebral arteries.
3. Describe the common pathologies associated with intracranial circulation.
4. Describe the effects of collateral flow on intracranial hemodynamics.
5. List the applications and limitations for TCD and TCI.

Course Outcome(s):
Perform standard scanning techniques for TCD and TCI.

Objective(s):
1. Explain the differences between TCD and TCI.
2. Demonstrate the anatomical approaches and proper depth settings used to insonate the intracranial vessels.
3. Complete a standard scanning protocol of the intracranial vessels using TCD and TCI.
4. Analyze and interpret the values used for interpretation of a TCD and TCI examination.

Methods of Evaluation:

1. Written tests/quizzes
2. Lab competency
3. Classroom assignments
4. Final exam

Course Content Outline:

Topical Outline

1. Anatomy
    a. Extracranial
        i. Carotid artery
        ii. Internal carotid artery
        iii. Vertebral artery
    b. Intracranial
        i. Circle of Willis and contributing arteries
            1. Internal carotid artery (Cavernous portion AKA carotid siphon)
                a. Segments (Parasellar, Genu, Supraclinoid)
                b. Ophthalmic artery
            2. Middle cerebral artery
            3. Anterior cerebral artery
            4. Anterior communicating artery
            5. Posterior communicating artery
            6. Posterior cerebral artery
            7. Basilar artery
        ii. Terminal vertebral artery
    c. Origin and termination of vessels
    d. Relational anatomy
    e. Collateral pathways
    f. Common congenital anomalies
2. Pathology
    a. Cerebrovascular Accident
    b. Atherosclerosis
    c. Thromboemboli
    d. Aneurysm
    e. Arterial dissection
    f. Arteriovenous fistula
3. Applications of TCD and TCI
    a. Monitoring of intracranial vessels for vasospasm
    b. Evaluation of intracranial aneurysm and arteriovenous malformation
    c. Basilar artery occlusion
    d. Intracranial internal carotid artery stenosis
    e. Adjunct to extracranial carotid duplex exam
    f. Monitoring vasospastic effect of sickle cell anemia
    g. Confirmation of brain death
    h. Microemboli detection during carotid endarterectomy, coronary bypass surgery, and carotid stenting
    i. Detection of right to left cardiac shunts and patent foramen ovale
    j. Monitoring real-time blood flow to brain during various surgical procedures
4. Transcranial Doppler/Transcranial Duplex Imaging Examination
    a. Differentiation between Transcranial Doppler and Transcranial Duplex Imaging
        i. Indirect assessment of vessels
        ii. Direct assessment
    b. Capabilities
    c. Limitations
    d. Patient positioning
    e. Instrumentation and transducer frequency for TCD and TCI
    f. Examination protocol
        i. Acoustic windows/approaches
        ii. Vessel depth

iii. Signal traceability
iv. Sample volume size
v. Transmit frequency/power

g. Imaging and spectral Doppler scanning techniques
h. Spectral Doppler interpretation
   i. Normal characteristics
      1. Flow direction
      2. Flow pattern
      3. Velocity ranges
   ii. Abnormal characteristics
   iii. Measurements
      1. Maximum of the mean velocity
      2. Peak systolic velocity
      3. End diastolic velocity
      4. Internal carotid artery/middle cerebral artery ratio
      5. Pulsatility index
      6. Pitfalls of measurements
      7. Embolic showers
   iv. Color Doppler interpretation
      1. Presence/absence of flow
      2. Direction of flow
      3. Flow characteristics

Resources

Katz, Mira, and Andrei Alexandrov. *Practical Guide to Transcranial Doppler Exams.* Littleton, CO: Summer Publishing, 2003.

McCartney, John P, Kathleen M Thomas-Luke, Camilo R. Gomez. *Handbook of Transcranial Doppler.* New York: Springer-Verlag, 1997.

Alexandrov, Andrei V. *Neurovascular Examination: The Rapid Evaluation of Stroke Patients Using Ultrasound Waveform Interpretation.* Hoboken, NJ: Wiley Blackwell, 2013.

Alexandrov, Andrei. *Cerebrovascular Ultrasound in Stroke Prevention and Treatment*. 2nd. Hoboken: Blackwell, 2011.

Kupinski, Ann Marie. "Chapter 10: Intracranial Cerebrovascular Examination by Colleen Douville" *Diagnostic Medical Sonography: The Vascular System*. 2nd. Philadelphia: Wolters Kluwer, 2018.

Pellerito, J. & Polak, J. "Chapter 12: Ultrasound Assessment of the Intracranial Arteries" *Introduction to Vascular Ultrasonography*. 6th. Philadelphia: Elsevier Saunders, 2012.

Top of page
Key: 1482