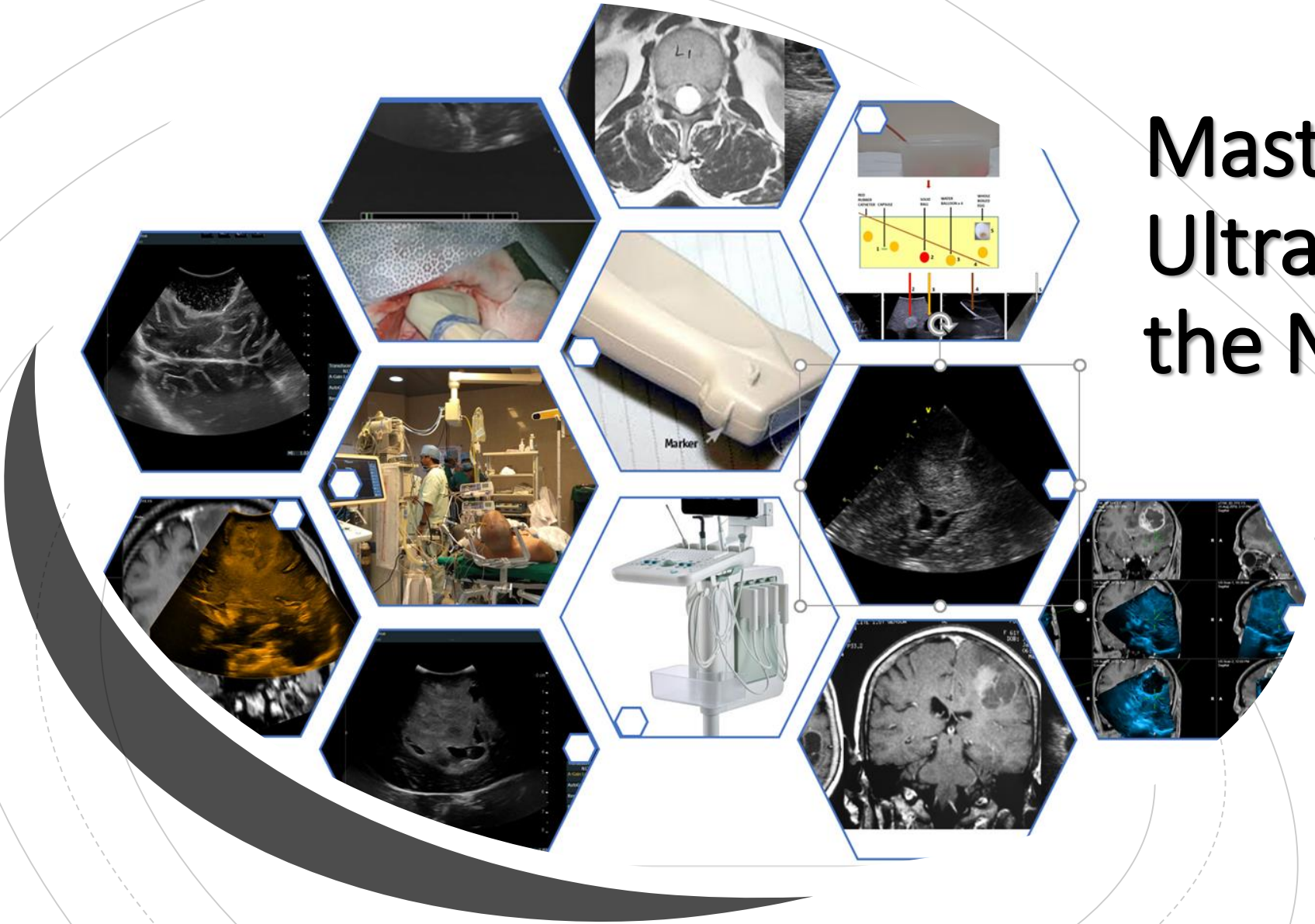


Mastering Basic Ultrasound Skills for the Neurosurgeon

Dr Aliasgar Moiyadi

Tata Memorial Centre, Mumbai, India

aliasgar.moiyadi@gmail.com

Disclosures

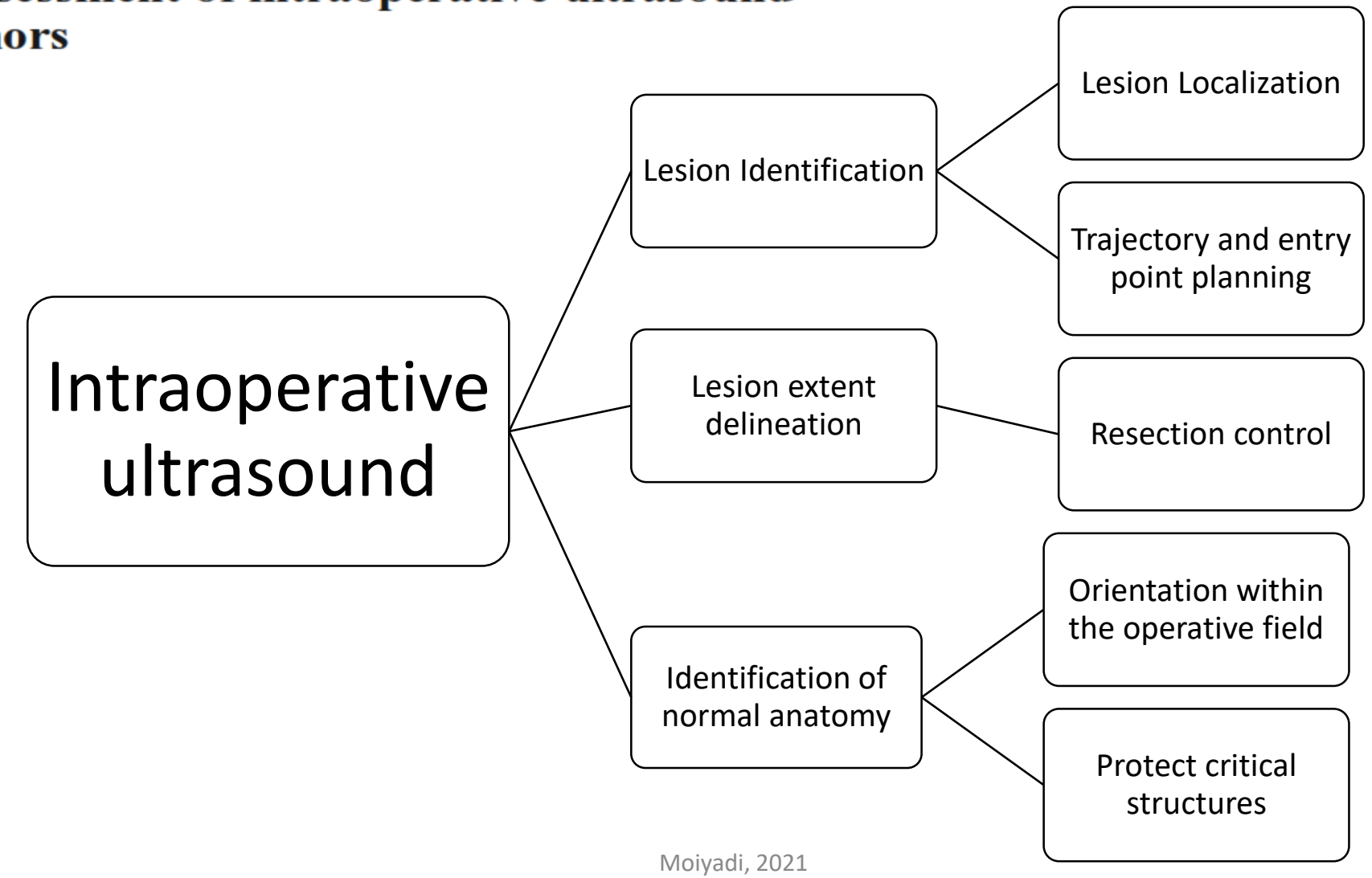
- Consultant
  - BK Medical
  - Brainlab

Acta Neurochir (2014) 156:703–704
DOI 10.1007/s00701-014-2010-3

LETTER TO THE EDITOR - BRAIN TUMORS

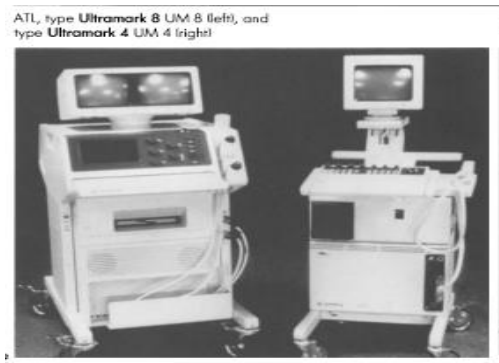
Objective assessment of intraoperative ultrasound in brain tumors

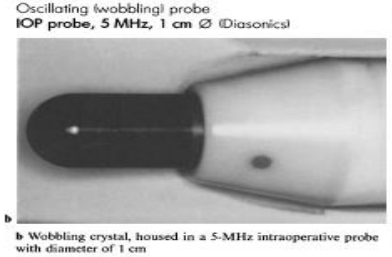
Aliasgar V. Moiyadi

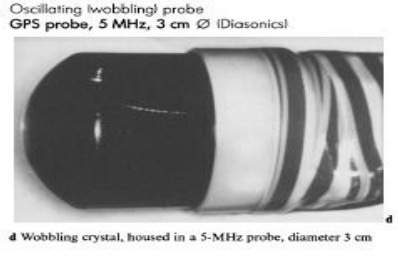


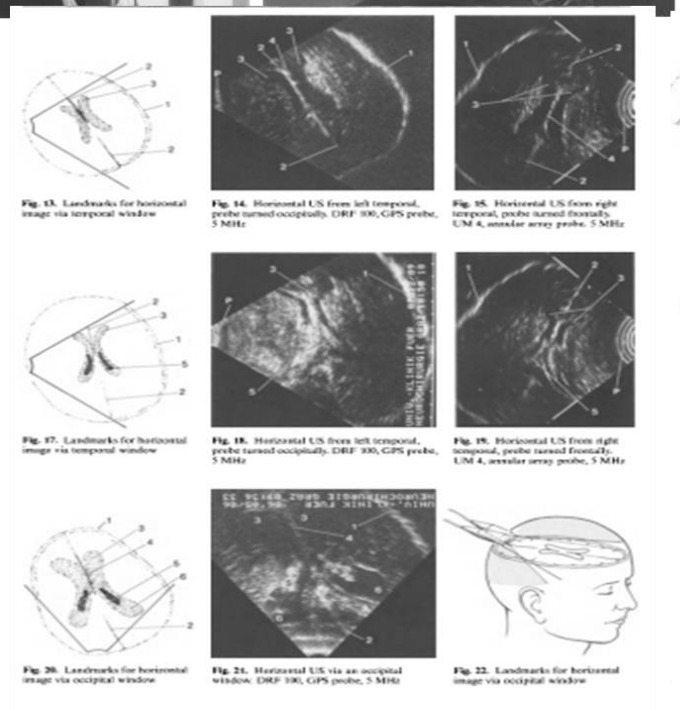
Moiyadi, 2021

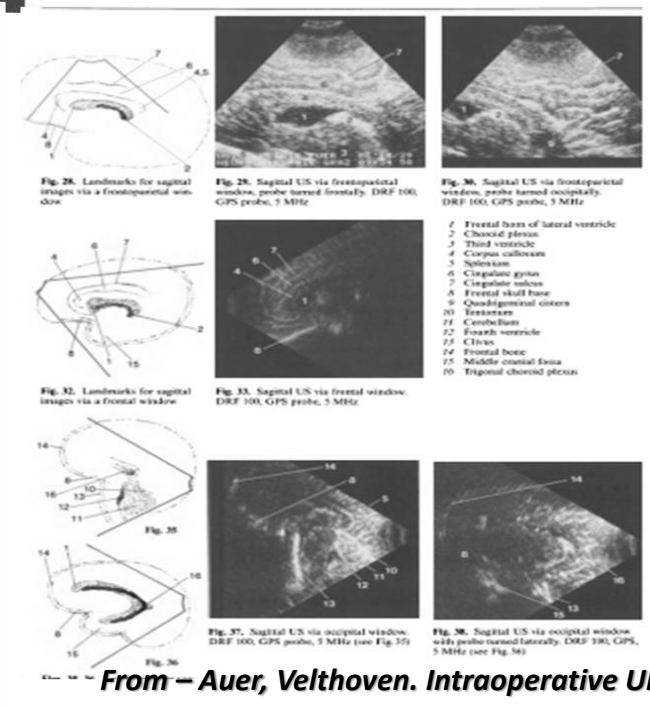
Prehistoric Era of US

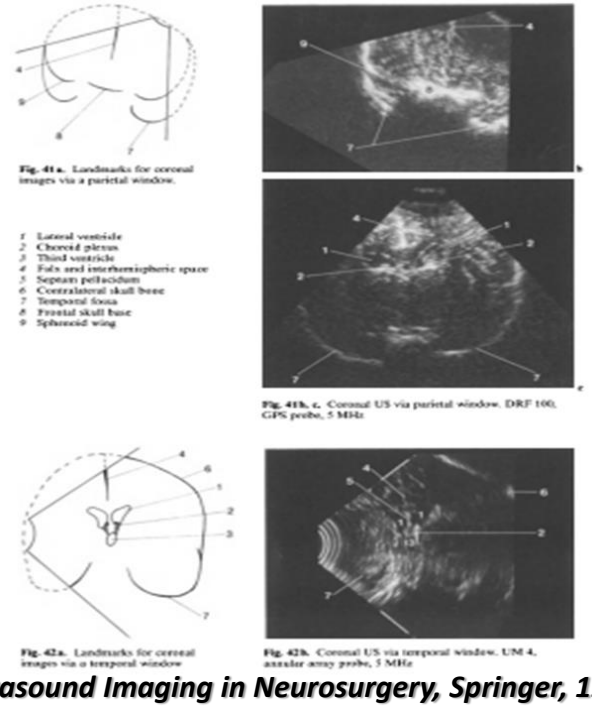












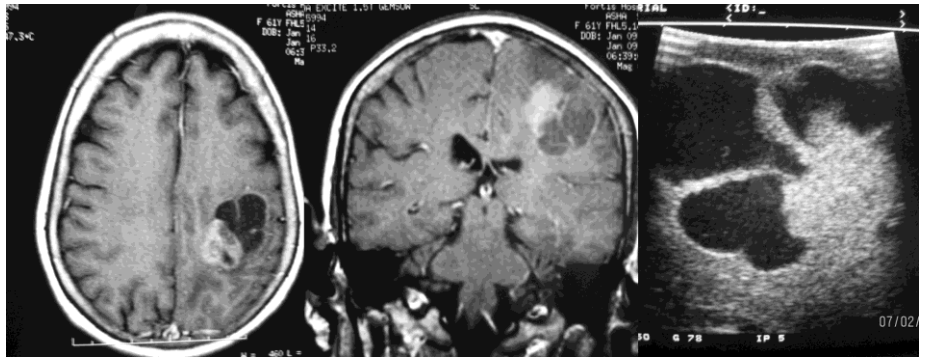
From – Auer, Velthoven. Intraoperative Ultrasound Imaging in Neurosurgery, Springer, 1990

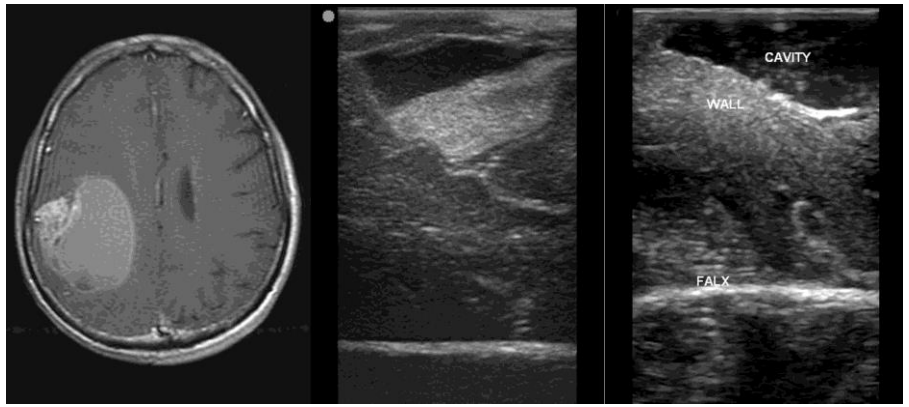
Limitation of IGS – Brainshift

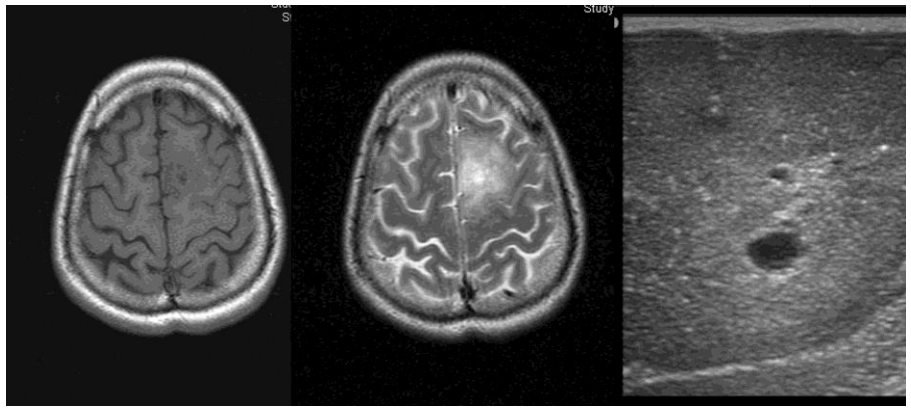
Improvements in US technology

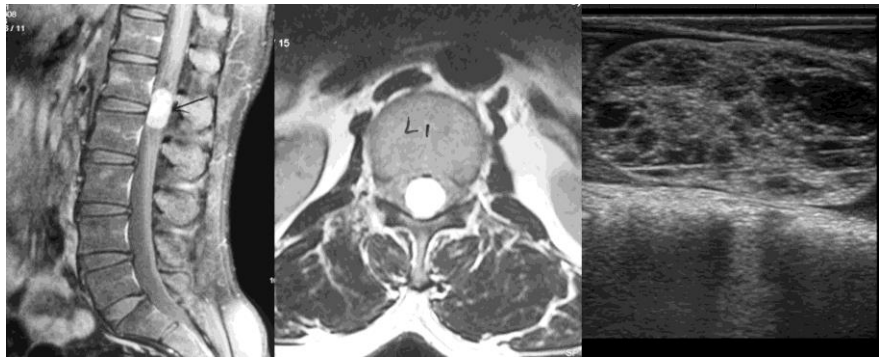
Resurgence of IOUS

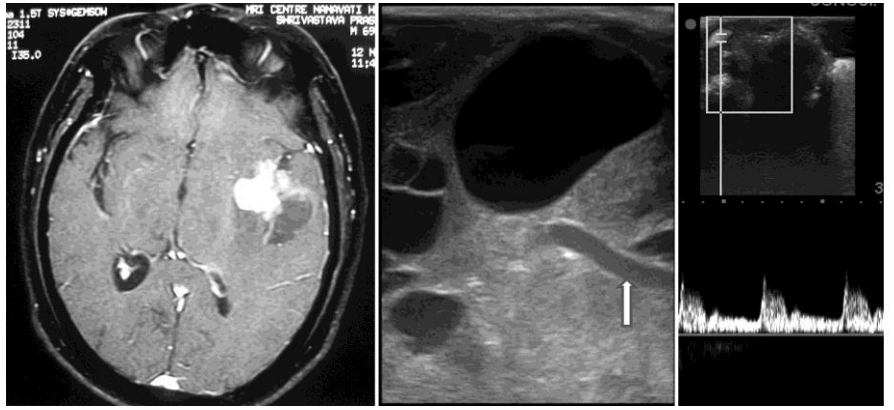
iUS- Improved Image resolution

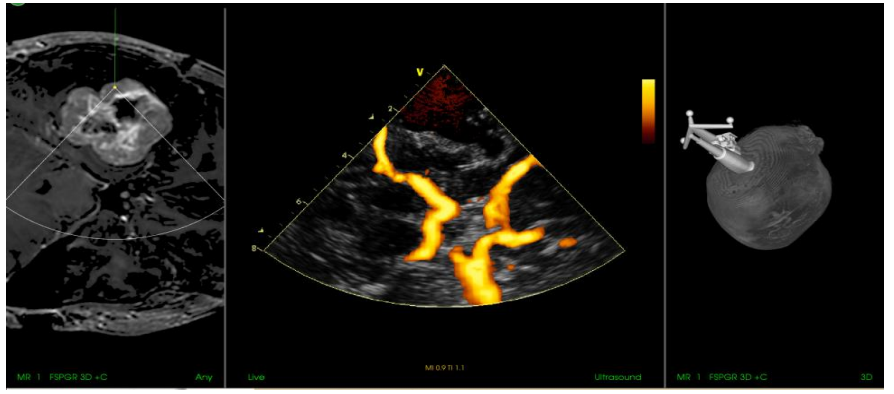










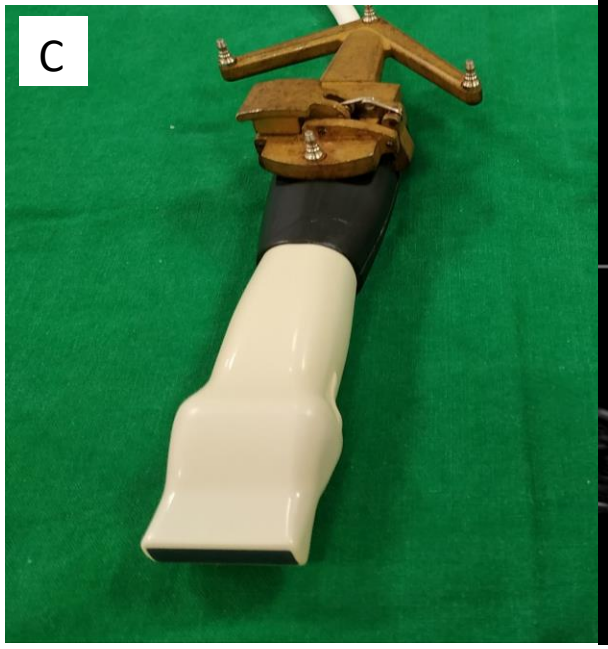


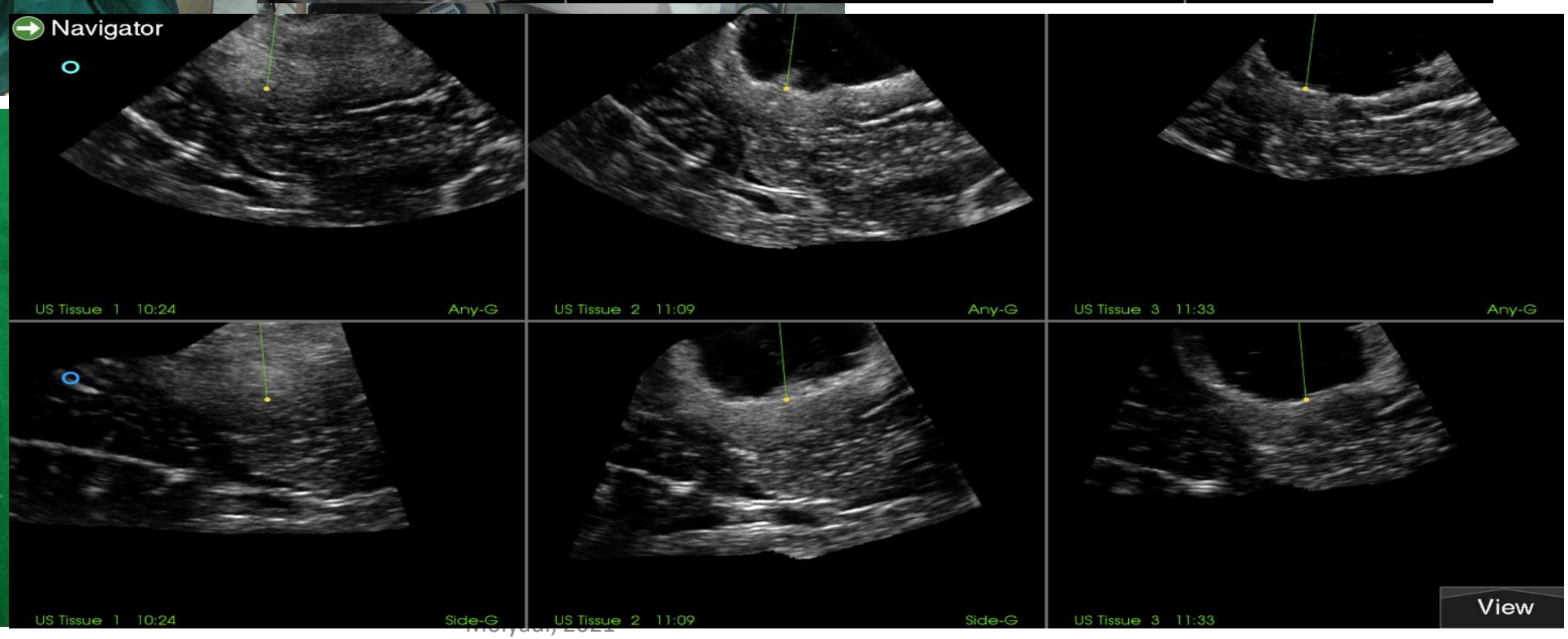
Moiyadi, 2021

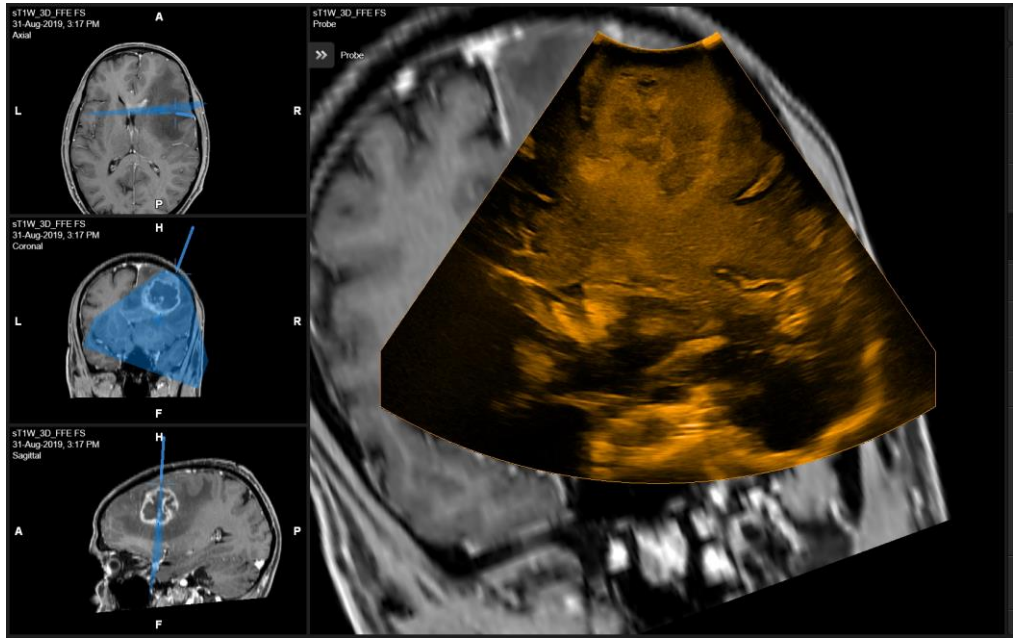

A

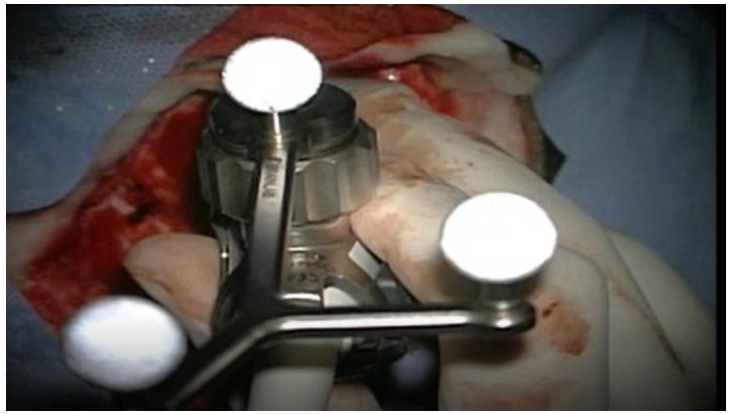

B

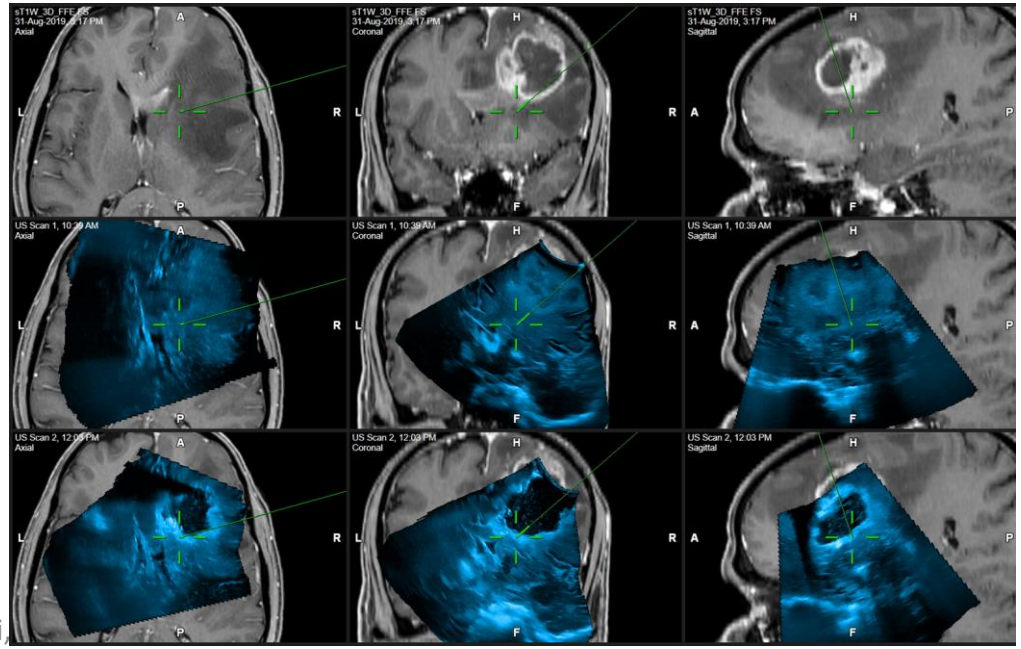

US Probe 5FPA


C


Navigator
US Tissue 1 10:24
Any-G
US Tissue 2 11:09
Any-G
US Tissue 3 11:33
Any-G
US Tissue 1 10:24
Side-G
US Tissue 2 11:09
Side-G
US Tissue 3 11:33
View

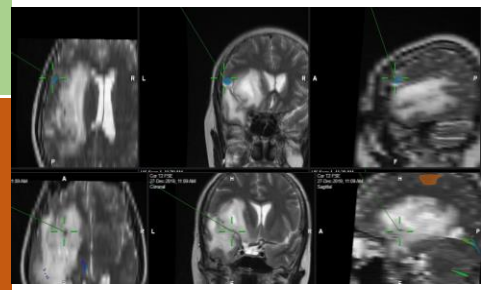

sT1W_3D_FFE FS
31-Aug-2019, 3:17 PM
Axial
sT1W_3D_FFE FS
31-Aug-2019, 3:17 PM
Coronal
sT1W_3D_FFE FS
31-Aug-2019, 3:17 PM
Sagittal
sT1W_3D_FFE FS
Probe
Probe

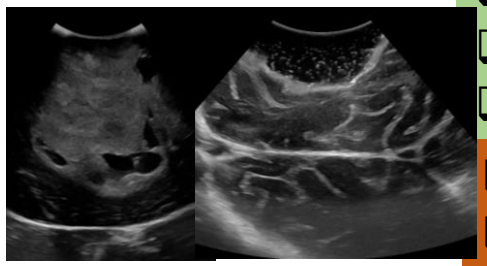



sT1W_3D_FFE FS
31-Aug-2019, 3:17 PM
Axial
sT1W_3D_FFE FS
31-Aug-2019, 3:17 PM
Coronal
sT1W_3D_FFE FS
31-Aug-2019, 3:17 PM
Sagittal
US Scan 1, 10:39 AM
Axial
US Scan 1, 10:39 AM
Coronal
US Scan 1, 10:39 AM
Sagittal
US Scan 2, 12:03 PM
Axial
US Scan 2, 12:03 PM
Coronal
US Scan 2, 12:03 PM
Sagittal

- Based on Preoperative MRI
- Multiplanar imaging with full head view of MRI

- Post-craniotomy brain-shift and brain deformation results in loss of accuracy
- Impossible to rely on for resection control





- Real time update
- Fast updates, repeatability
- Convenient, readily available
- Cost-effective

- Operator dependent
- Learning curve
- Orientation and image interpretation difficult

Navigation with preoperative MRI

2-D Ultrasound

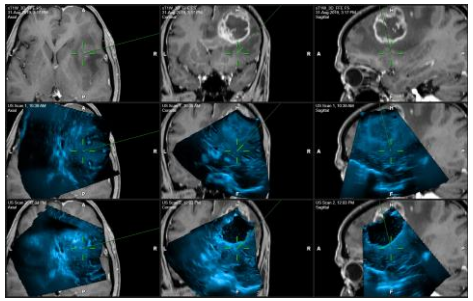
Multimodal Intraoperative Image guidance

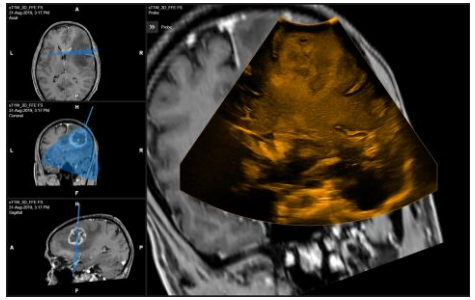
Navigated 3-D Ultrasound

Navigated 2-D Ultrasound

- Multiplanar US image displays with co-display of corresponding MR
- Serial US images in coplanar displays possible
- Brain-shift compensation
- Direct Navigated US option

- Costlier (but still many times lower than IOMR)





- US-MR image fusion improves US orientation and image interpretation
- Brain-shift appreciation and compensation
- More intuitive

- Multiplanar US views not possible especially in conventional ACS planes
- Co-registration of serially acquired US images not possible

Moiyadi, 2021

Acta Neurochir (2013) 155:2217–2225
DOI 10.1007/s00701-013-1881-z

CLINICAL ARTICLE - BRAIN TUMORS

Usefulness of three-dimensional navigable intraoperative ultrasound in resection of brain tumors with a special emphasis on malignant gliomas

Aliasgar V. Moiyadi · Prakash M. Shetty · Abhishek Mahajan · Amar Udare · Epari Sridhar

NEUROSURGICAL FOCUS

Neurosurg Focus 40 (3):E5, 2016

Direct navigated 3D ultrasound for resection of brain tumors: a useful tool for intraoperative image guidance

Aliasgar V. Moiyadi, MCh, and Prakash Shetty, MCh

Division of Neurosurgery, Department of Surgical Oncology, Tata Memorial Centre, Mumbai, India

Navigable 3D-Ultrasound Facilitates Supra-Radical Resections beyond the Contrast-Enhancing Boundaries in Malignant Gliomas

Shubhi Dubey[1] Amit Janu[2] Suresh Chaudhari[3] Aliasgar Moiyadi[1]

[1]Department of Neurosurgery, Tata Memorial Centre, Mumbai, India
[2]Department of Radiodiagnosis, Tata Memorial Centre, Mumbai, India
[3]Department of Medical Physics, Tata Memorial Centre, Mumbai, India

Address for correspondence Aliasgar Moiyadi, MCh, Department of Neurosurgery, Tata Memorial Centre, E Borges Rd, Parel Mumbai 12, Mumbai, Maharashtra 400012, India
(e-mail: aliasgar.moiyadi@gmail.com).

J Neurol Surg A

NI Feature: CENTS (Concepts, Ergonomics, Nuances, Therbligs, Shortcomings)

ORIGINAL ARTICLE

Neurol India 2015;63:727-35.

Navigated intraoperative ultrasound for resection of gliomas: Predictive value, influence on resection and survival

Aliasgar V. Moiyadi, Sadhana Kannan[1], Prakash Shetty
Department of Neurosurgery, Advanced Centre for Training, Research and Education in Cancer (ACTREC), Tata Memorial Centre,
[1]Department of Biostatistics, ACTREC, Navi Mumbai, Maharashtra, India

Non-enhancing gliomas: does intraoperative ultrasonography improve resections?

Aliasgar V. Moiyadi, Prakash Shetty, Robin John

Division of Neurosurgery, Department of Surgical Oncology, Tata Memorial Centre, Homi Bhabha National Institute, Mumbai, India

ULTRA SONO GRAPHY

ORIGINAL ARTICLE

https://doi.org/10.14366/usg.18032
pISSN: 2288-5919 • eISSN: 2288-5943
Ultrasonography 2019;38:156-165

Comparison of outcomes of free-hand 2-dimensional ultrasound-guided versus navigated 3-dimensional ultrasound-guided biopsy for supratentorial tumours: a single-institution experience with 125 cases

Aditya D. Patil, Vikas Singh, Vivek Sukumar, Prakash M. Shetty, Aliasgar V. Moiyadi

Division of Neurosurgery, Department of Surgical Oncology, Tata Memorial Centre, Homi Bhabha National Institute, Mumbai, India

ULTRA SONO GRAPHY

ORIGINAL ARTICLE

https://doi.org/10.14366/usg.18036
pISSN: 2288-5919 • eISSN: 2288-5943
Ultrasonography. 2018 Dec 8.
Epub ahead of print

Moiyadi, 2021

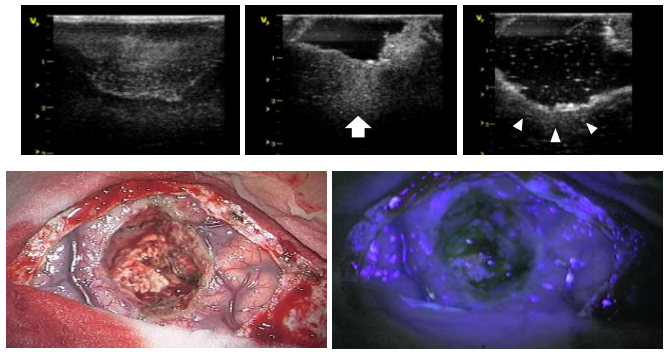
Navigable Intraoperative Ultrasound and Fluorescence-Guided Resections Are Complementary in Resection Control of Malignant Gliomas: One Size Does Not Fit All

Aliasgar Moiyadi[1] Prakash Shetty[1]

[1] Department of Neurosurgery, Tata Memorial Centre, Mumbai, India

J Neurol Surg A

Address for correspondence Aliasgar Moiyadi, MCh, Department of Neurosurgery, Tata Memorial Centre, E. Borges Rd., Mumbai 400012, India (e-mail: aliasgar.moiyadi@gmail.com).



Early Experience with Combining Awake Craniotomy and Intraoperative Navigable Ultrasound for Resection of Eloquent Region Gliomas

Aliasgar Moiyadi[1] Prakash Shetty[1]

[1] Department of Neurosurgery, Tata Memorial Centre, Mumbai, India

J Neurol Surg A 2017;78:105–112.

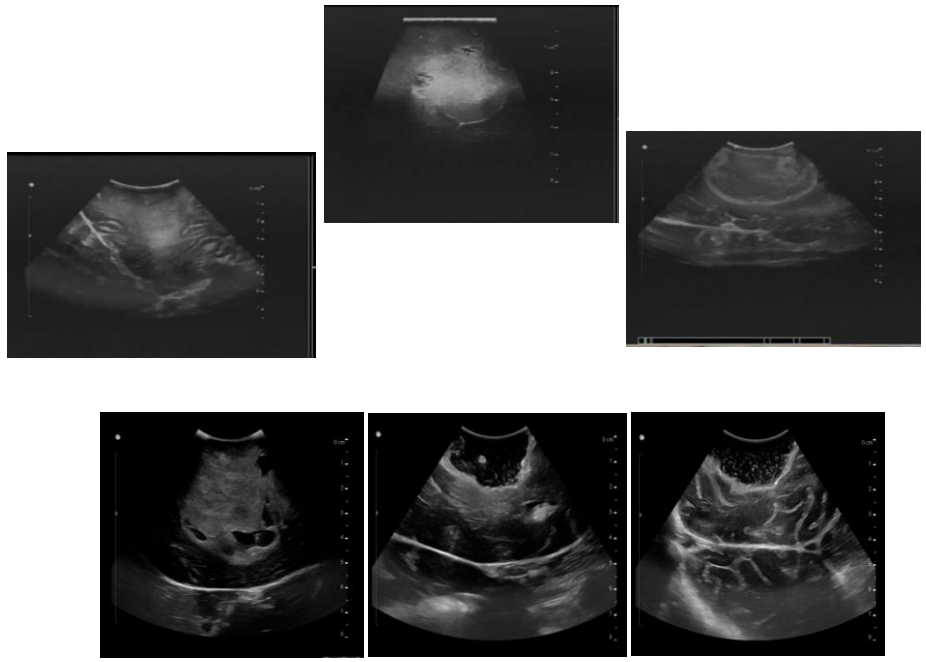
Address for correspondence Aliasgar Moiyadi, MCh, Department of Neurosurgery, Tata Memorial Centre, E. Borges Road, Parel, Mumbai 400012, India (e-mail: aliasgar.moiyadi@gmail.com).

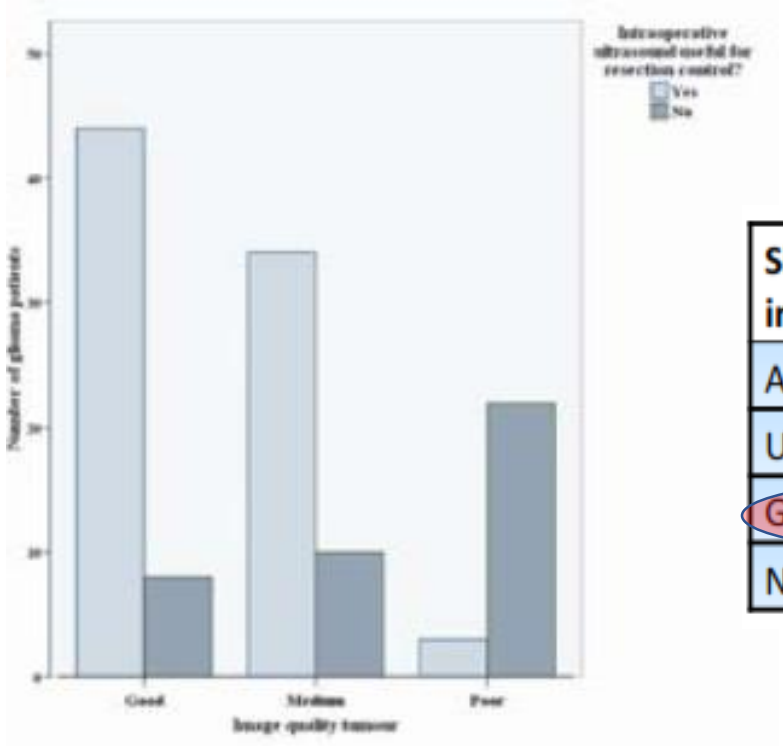
As part of a Multimodal Approach

Moiyadi, 2021

Good basic 2D B mode US Image

- Important to get a good quality image
- Better the image quality → better the utility of the US → better the extent of resection (*Solheim et al, 2012*)
- And lower neurological morbidity (3% vs 45%)





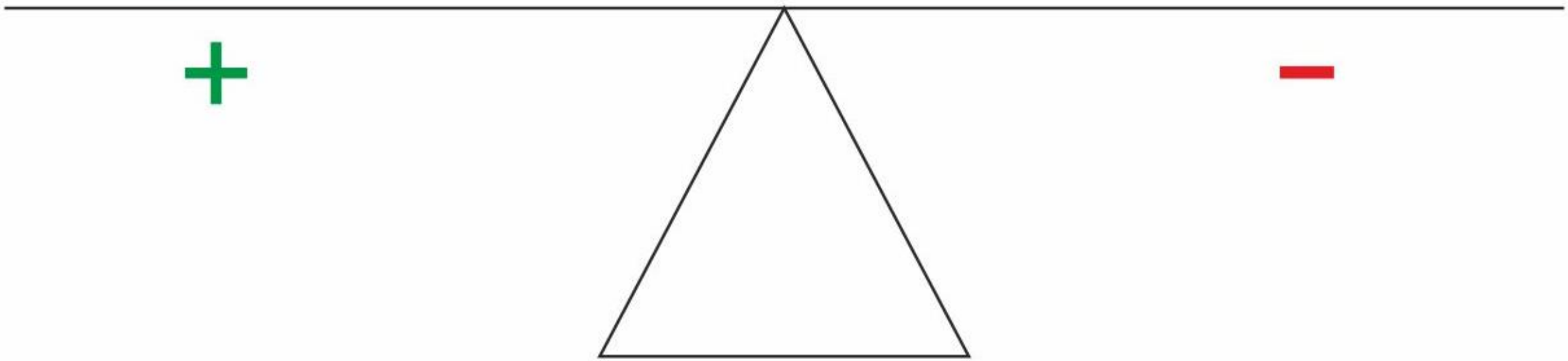
Significant variables in the regression model	Multi-variate OR	95% CI	p-value
Aim: GTR	24.73	4.32 to 141.42	<0.001*
Unifocal lesion	18.00	2.62 to 123.67	0.003*
Good/medium US image quality	7.63	1.28 to 45.44	0.026*
Non-eloquent location ∞	4.00	1.30 to 12.50	0.015*

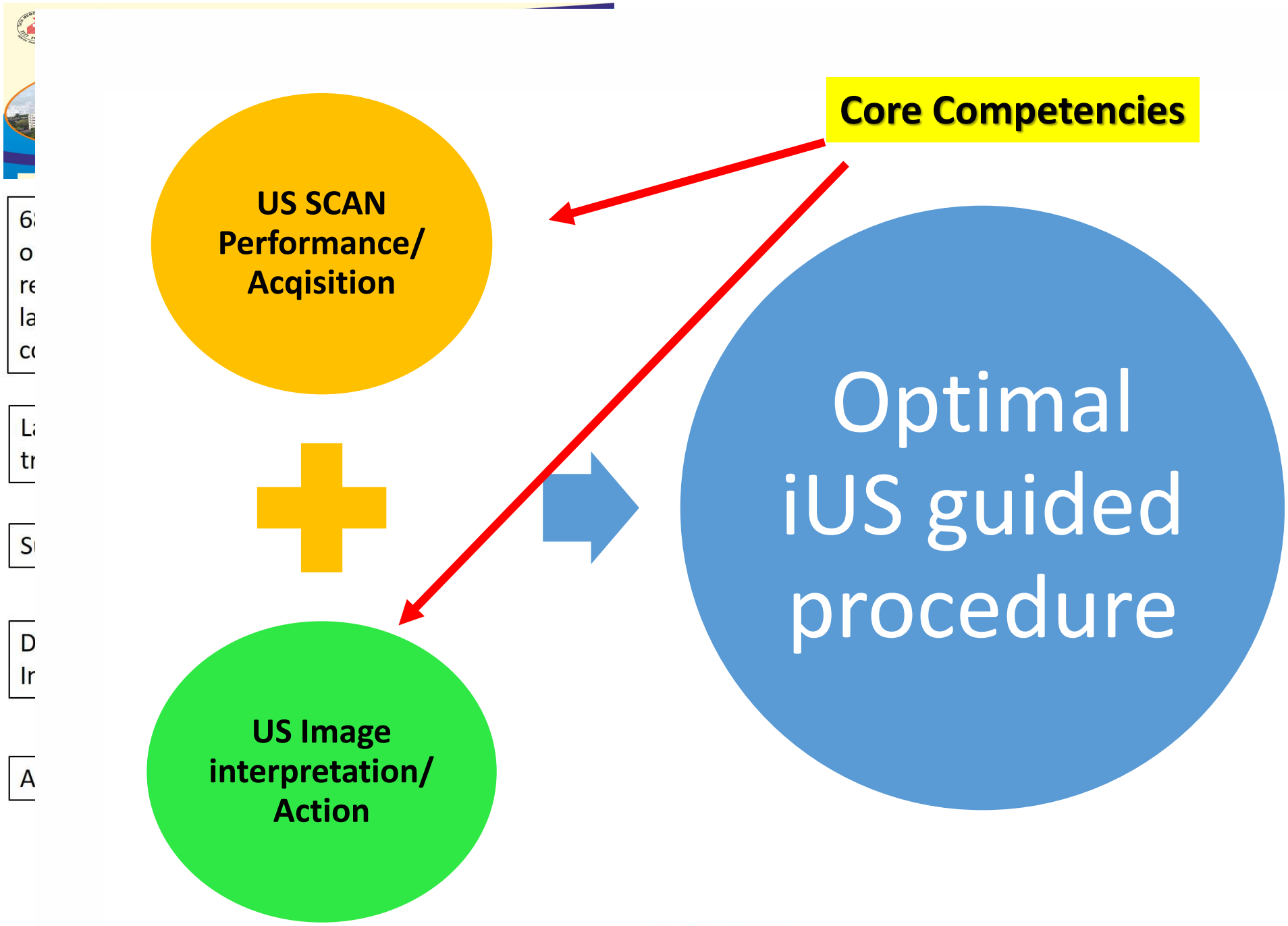
Moiyadi, 2021

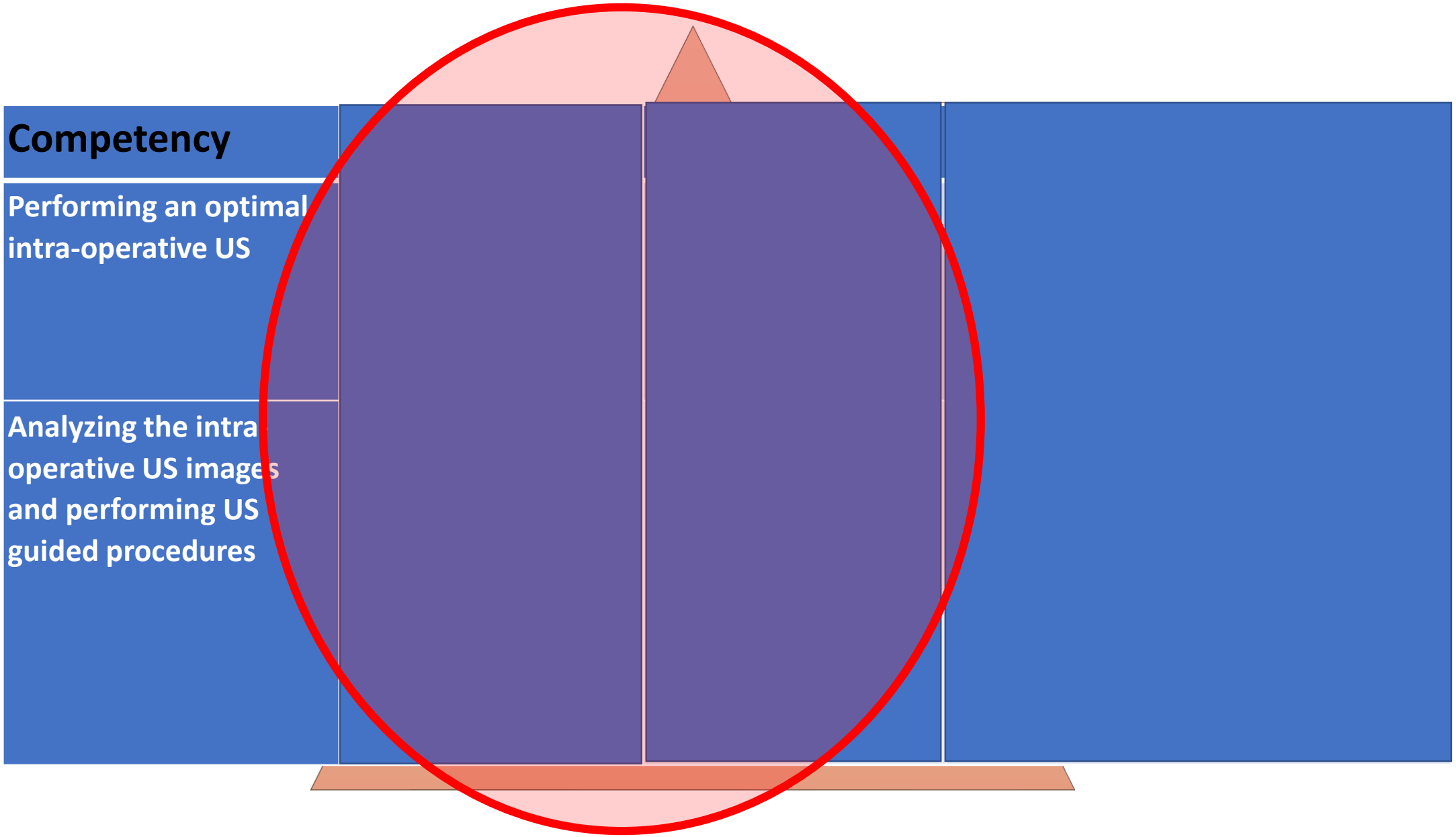

A fool with a tool
is still a fool!

+Real Time
+Wide Availability
+Low cost
+Quick
+Safe

- Unfamiliar Images & equipment
- Orientation problem
- Limited field of View




Core Competencies
US SCAN
Performance/
Acqisition
Optimal
iUS guided
procedure
US Image
interpretation/
Action



Moiyadi, 2021

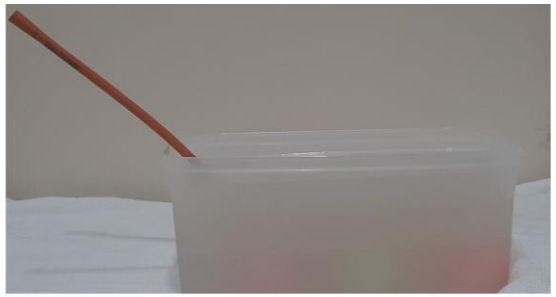
Practical Skill sets (Hands-on)	
Insonation Technique (visuomotor skills)	Acoustic Coupling Methodical insonation
Visuo-spatial Orientation Skills	Identify 3D shape and sizes of various structures Identify depth, lie and positions of different structures
Hand Eye coordination (visuomotor/visuospatial)	Performing wide orthogonal scan with orientation of direction Target various objects and lesions at different depths
Theoretical Skill sets (Knowledge)	
Technical Knowhow	Familiarization with the Equipment/ Controls Insonation with various probes Optimizing US scan parameters
Image interpretation	Semeiology Anatomical Landmarks Pathological anatomy Appreciate and identify artefacts

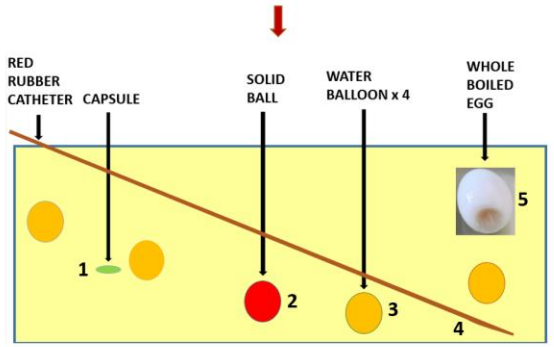
WORLD NEUROSURGERY, HTTPS://DOI.ORG/10.1016/J.WNEU.2020.07.044

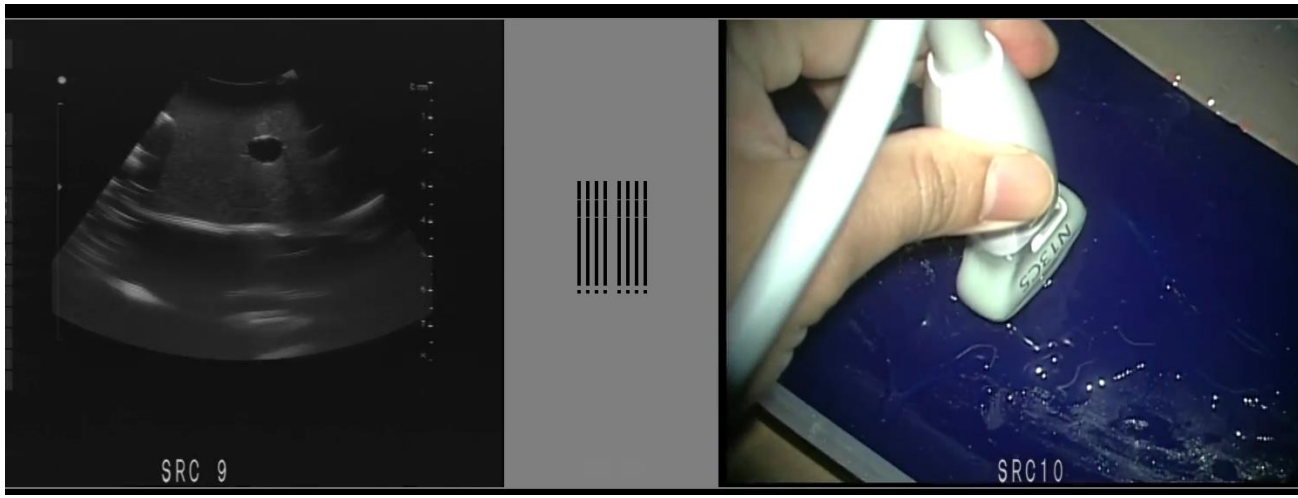
Practical Skill Acquisition

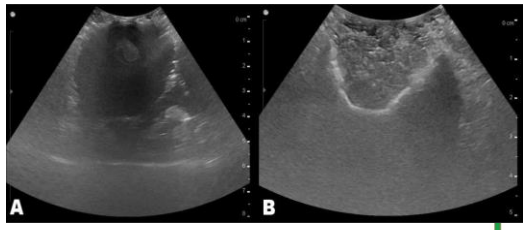
Customized Low-Cost Model for Hands-on Training in Intraoperative Ultrasound for Neurosurgeons: Our Experience and Review of Literature

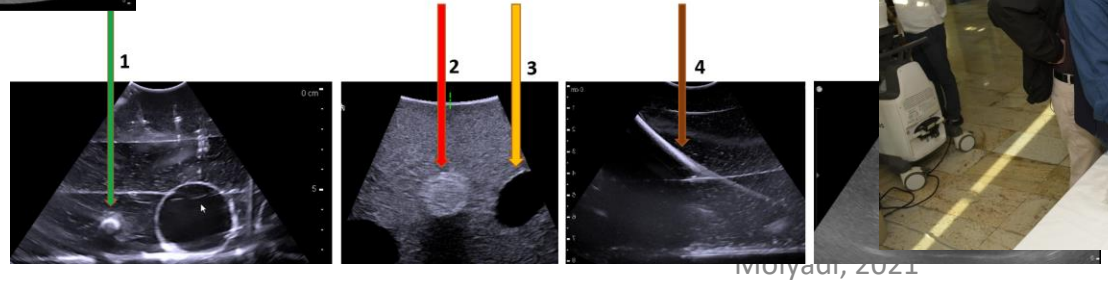
Vikas Singh[1,2], Salman Shaikh[1], Prakash Shetty[1,2], Aliasgar Moiyadi[1,2]











Atlas Based Training

[redacted]

Image Interpretation – Iterative Learning

Credits – Dr Amit Choudhary/ Dr Ajit Mishra

NeuroStream

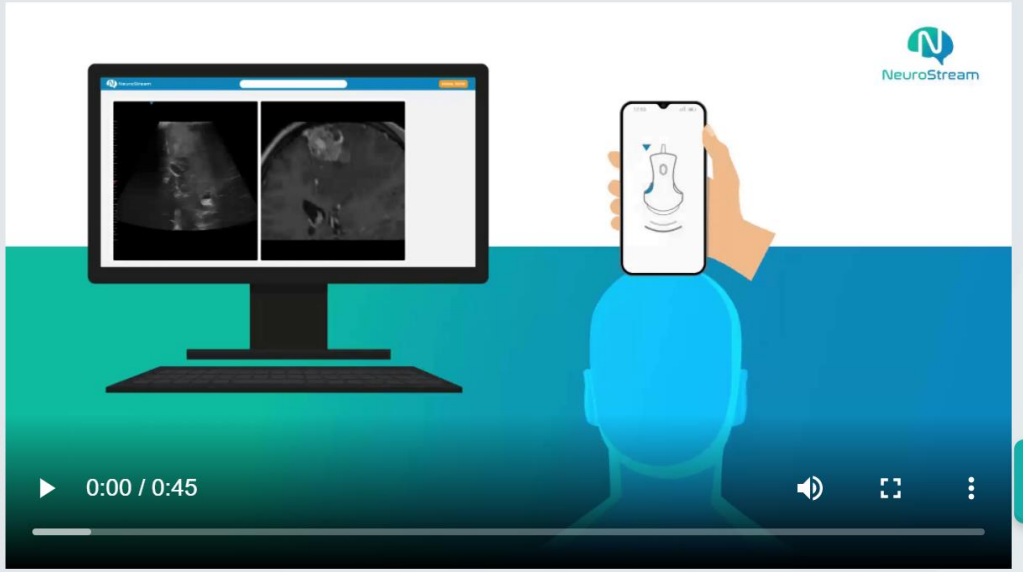
Login →

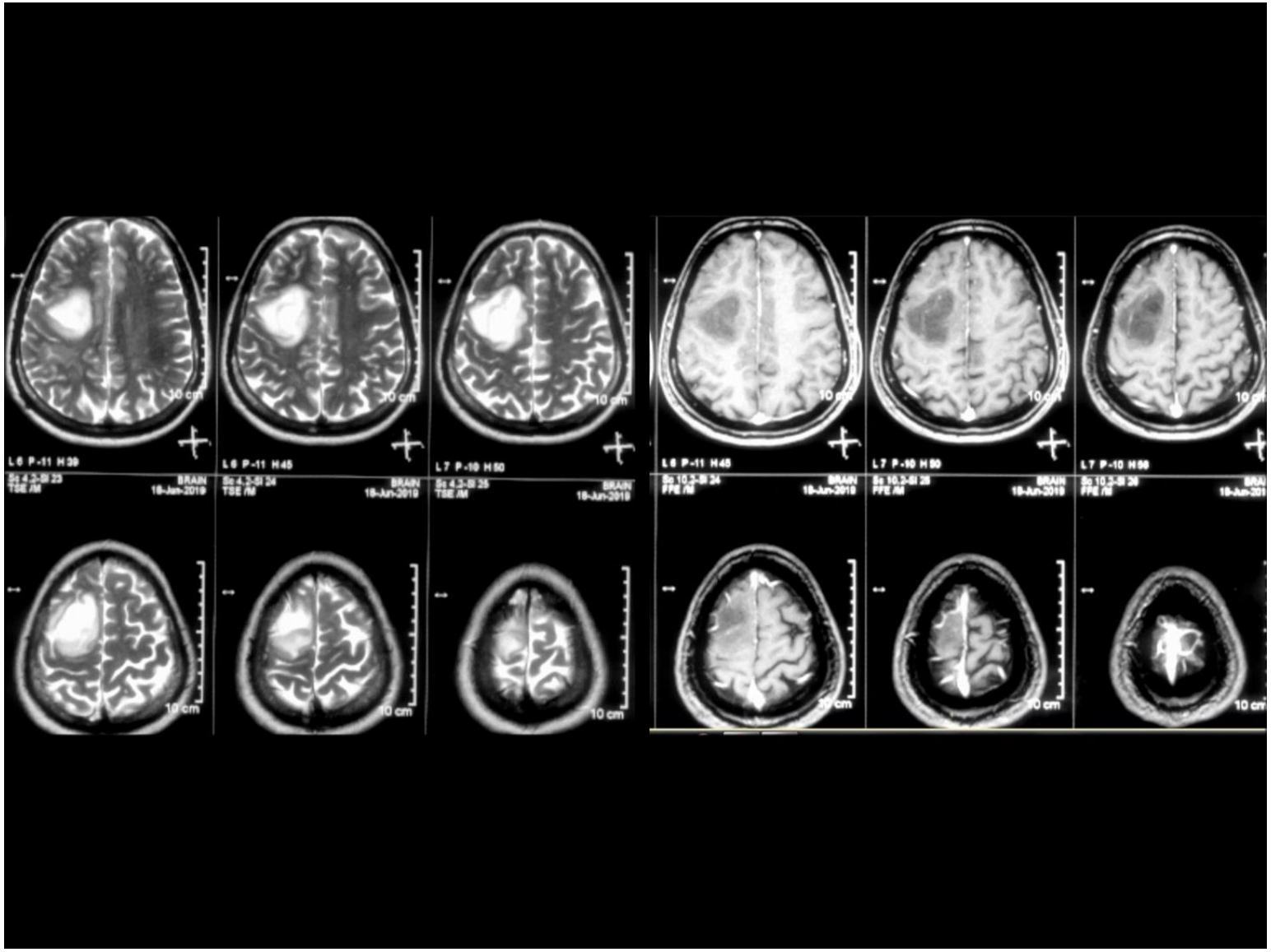
Register →

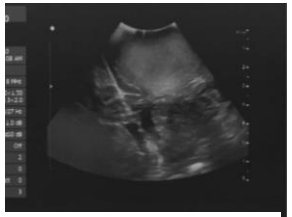
Master The Use Of Intraoperative Ultrasound

Train and become proficient in neurosurgical intraoperative ultrasound.

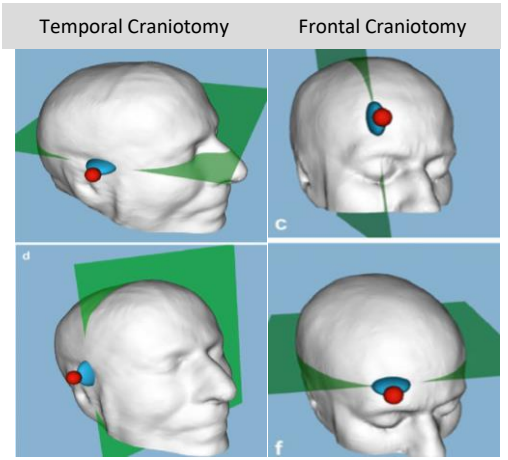
You can practice anytime by simulating the use of an ultrasound transducer with your smartphone and navigating diagnostic images created by experts.



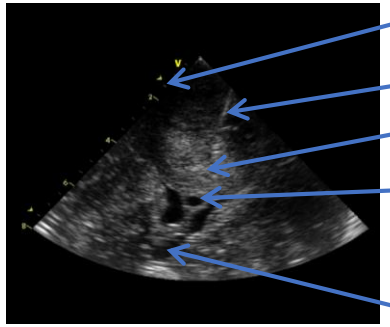


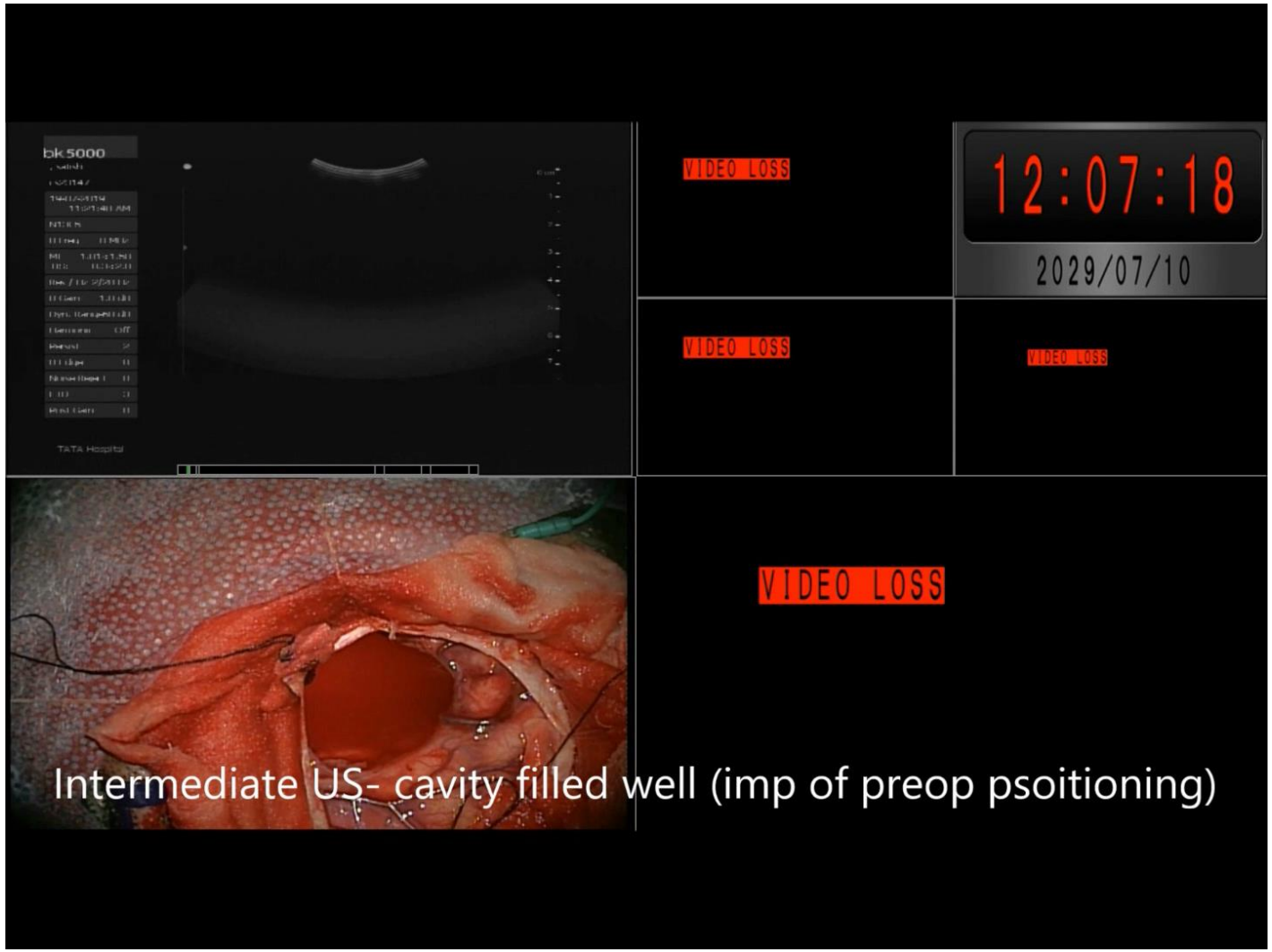


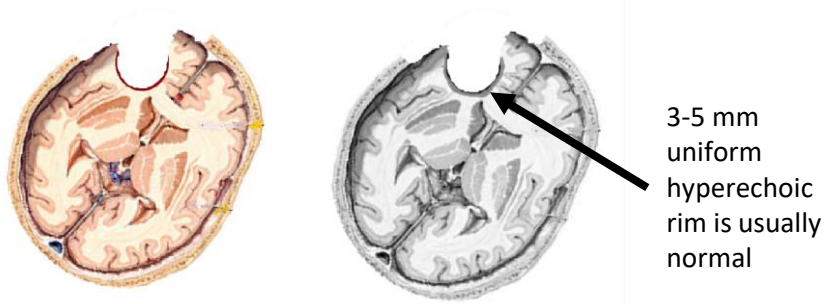
Adequate craniotomy



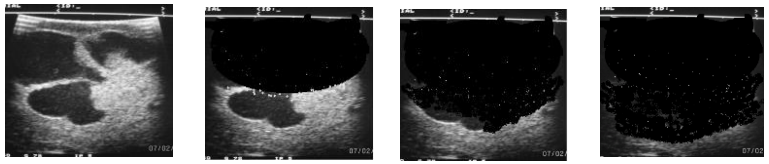
From Prada et al (eds): Intraoperative Ultrasound (IOUS) in Neurosurgery



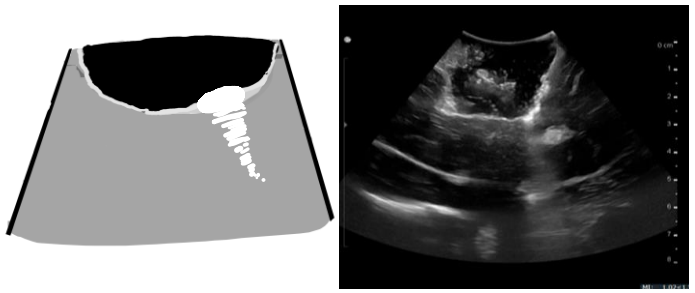




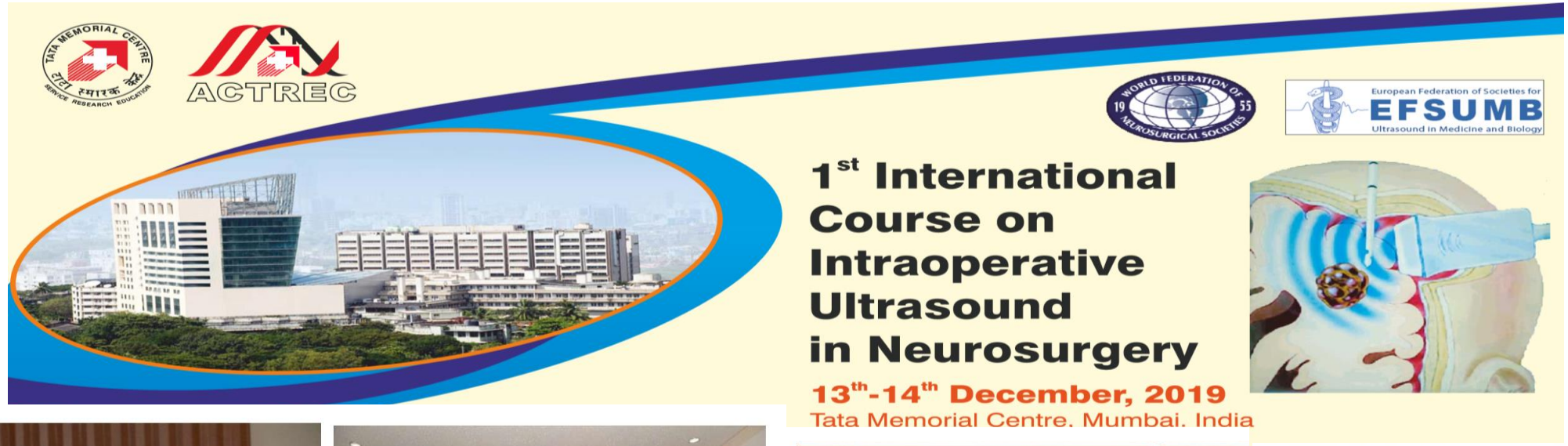
SERIAL RESECTION CONTROL SCANS

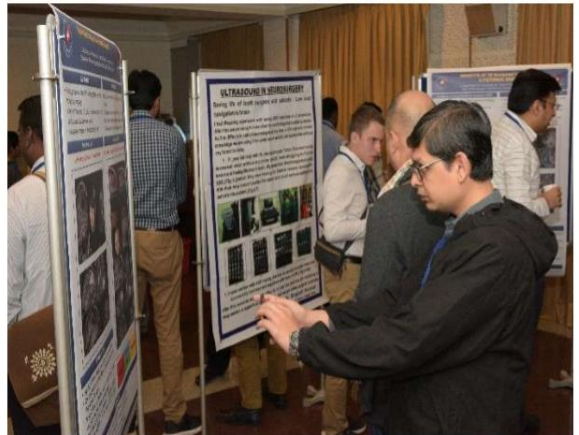


Understanding Artefacts



Skill Sets		Training Methods		
		Phantom/ Model Based	Simulation / Atlas Based	Live surgery Mentoring
Practical Skill sets				
Insonation Technique	Acoustic Coupling	√		√
	Methodical insonation	√	√	√
Visuo-spatial Orientation Skills	Identify 3D shape and sizes of various structures	√	√	√
	Identify depth, lie and positions of different structures	√	√	√
Hand Eye coordination	Performing wide orthogonal scan with orientation of direction	√	√	√
	Target various objects and lesions at different depths	√		√
Theoretical skill sets				
Technical Knowhow	Familiarization with the Equipment/ Controls	√		√
	Insonation with various probes	√		√
	Optimizing US scan parameters	√		√
Image interpretation	Semeiology	√	√	√
	Anatomical Landmarks		√	√
	Pathological anatomy		√	√
	Appreciate and identify artefacts	√	+/-	√


TATA MEMORIAL CENTRE
SERVICE RESEARCH EDUCATION
ACTREC
WORLD FEDERATION OF NEUROSURGICAL SOCIETIES
European Federation of Societies for
EFSUMB
Ultrasound in Medicine and Biology
1st International Course on Intraoperative Ultrasound in Neurosurgery
13th-14th December, 2019
Tata Memorial Centre, Mumbai, India



CNS | 2021 ANNUAL MEETING

Why Attend? | Registration | Program | Hotel & Travel | Exhibit | Awards | Residents | Health & Safety | Register

International Ultrasound Symposium

Sunday, October 17, 2021 - 8:00 am - 12:00 pm

Directors/Moderators: Francesco DiMeco, Brian V. Nahed, Geirmund Unsgård

Faculty: Aliasgar V. Moiyadi, Llewellyn Padayachy, Vikram C. Prabhu, Francesco Prada

Course ID: SYM13A

Cost: Physician: $250; Nurse/NP/PA: $200; Resident/Medical Student: $125

REGISTER HERE