

Psychosurgery

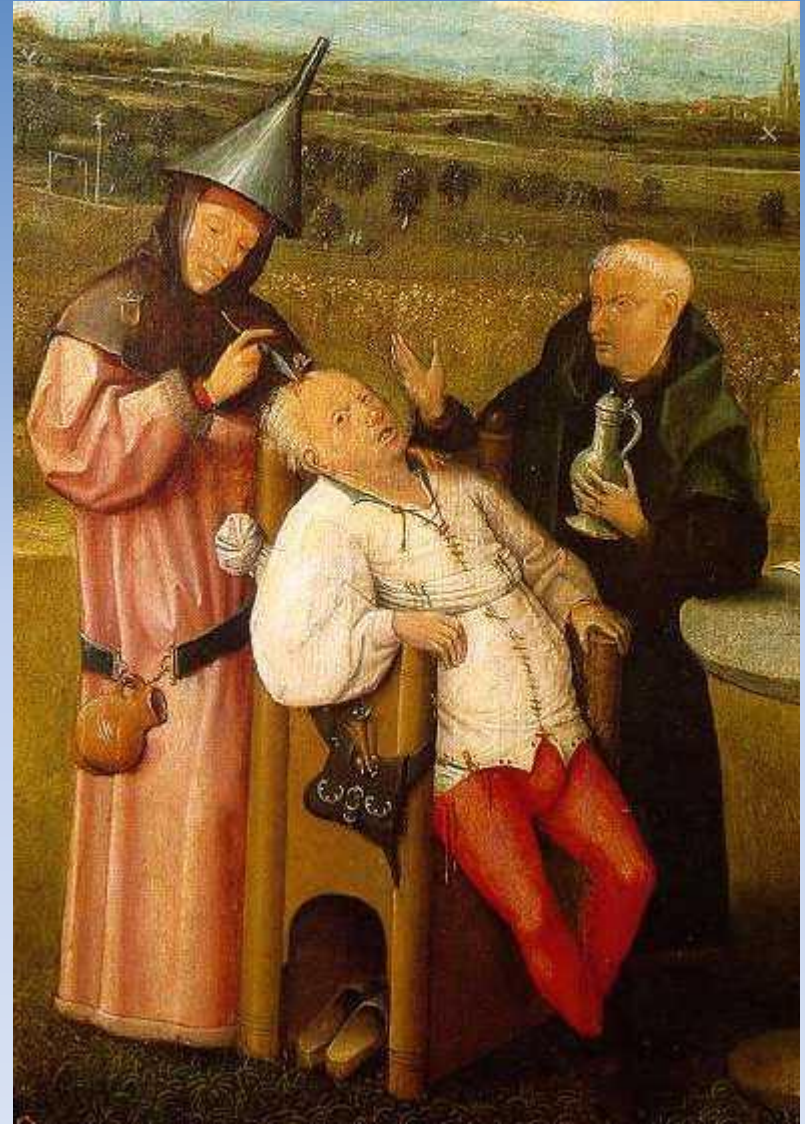
An Introduction

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Center for Neuromodulation and Pain

Shiraz, Iran



Sucker Punch, 2011



Famous Movies Depicting Psychosurgery



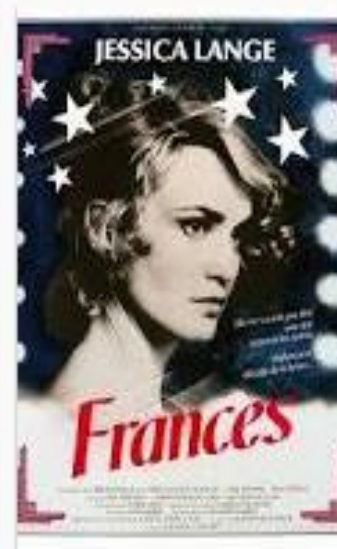
Sucker Punch
2011



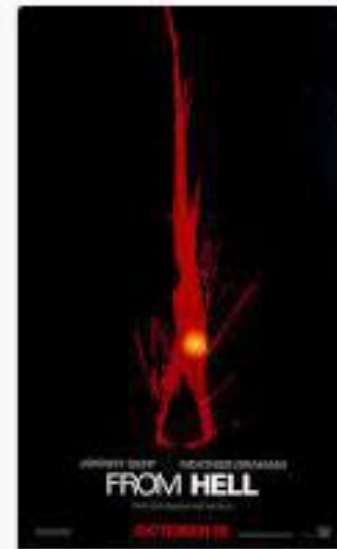
Shutter Island
2010



Suddenly,
Last Summer
1959



Frances
1982



From Hell
2001

Police arrest parents over death of OCD woman whose phobia of germs was so severe she showered for 20 HOURS a day

By ANDY DOLAN

Last updated at 11:39 AM on 7th February 2011

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- **'She was our daughter and we loved her,' say frail couple**
- **40-year-old constantly scrubbed hands and was too terrified to cook for herself**

An elderly couple have been arrested on suspicion of the manslaughter of their daughter who was so blighted by obsessive compulsive disorder she spent up to 20 hours a day in the shower.

Samantha Hancox, 40, was found dead in an armchair at the home she had hardly left in 18 years for fear of coming into contact with germs.

Her parents Ken and Marion Hancox dialled 999 but were later questioned for seven hours after being arrested and taken to a police station to be fingerprinted.

A post mortem examination revealed their daughter, their only child, died of dehydration and a skin infection.

Mr Hancox, 76, who has bone cancer, and his 77-year-old wife are on bail while further investigations take place into the death.

They told yesterday how their daughter, a former law student, suffered from acute obsessive compulsive disorder (OCD) which left her a virtual recluse with a crippling phobia about germs.

As the condition took hold, Miss Hancox would wear socks on her hands which she scrubbed constantly. In her final years only her parents were allowed into the house to try to keep it germ-free.



At 19: Samantha before the illness took over her life



Samantha studied law but left before finishing her course when her phobia worsened. In recent years, the troubled woman would shower for 20 hours a day and spent all her time cocooned in the front room watching TV



Functional Neurosurgery

Acute anatomical intervention ➡ Chronic change in function

Treatment of conditions where:

the CNS physiology (normal function) is altered but

the anatomy **may** or **may not** be normal

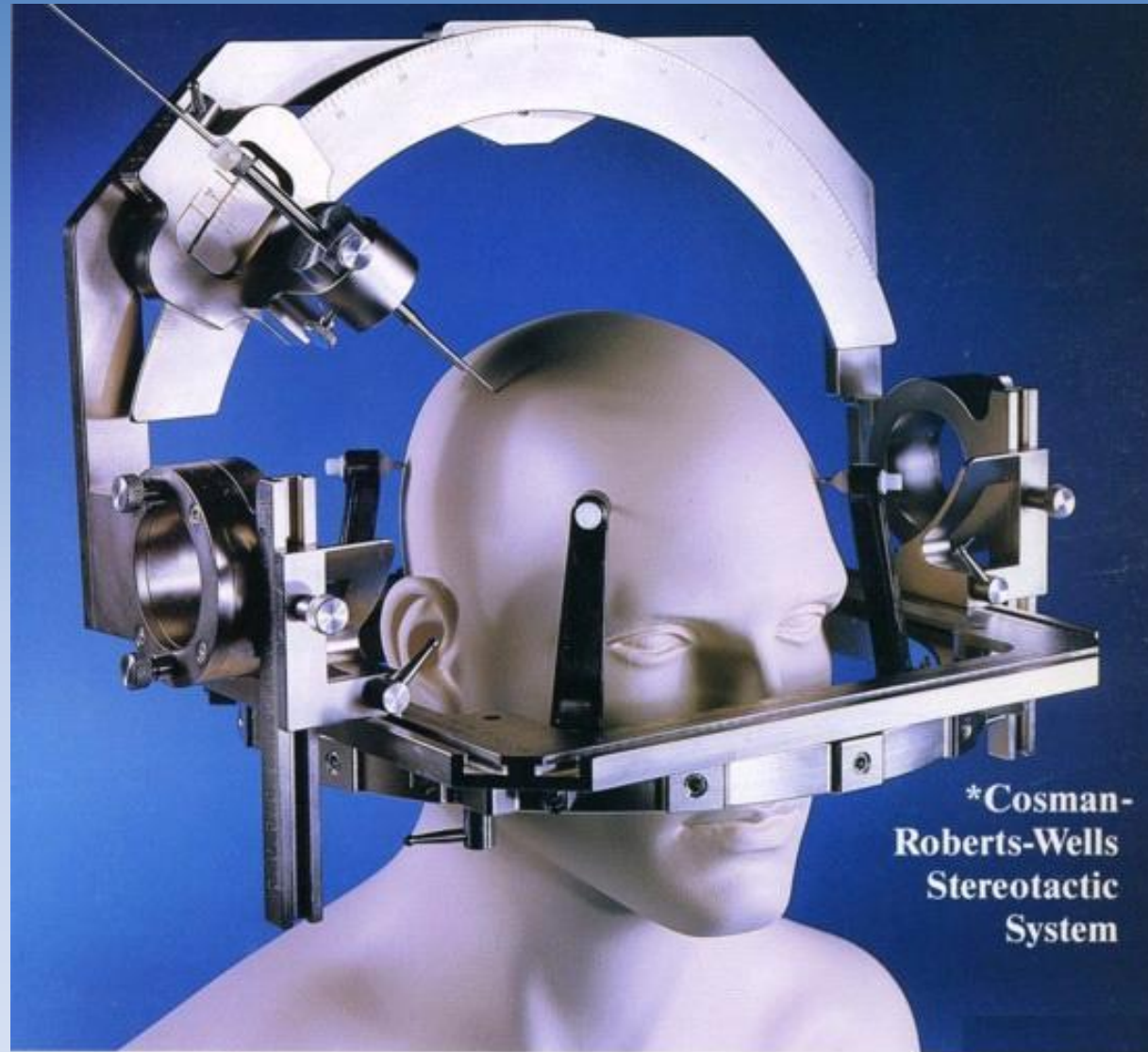
Functional Neurosurgery

Includes:

- Ablative procedures
- Stimulative procedures (Neuroaugmentation)

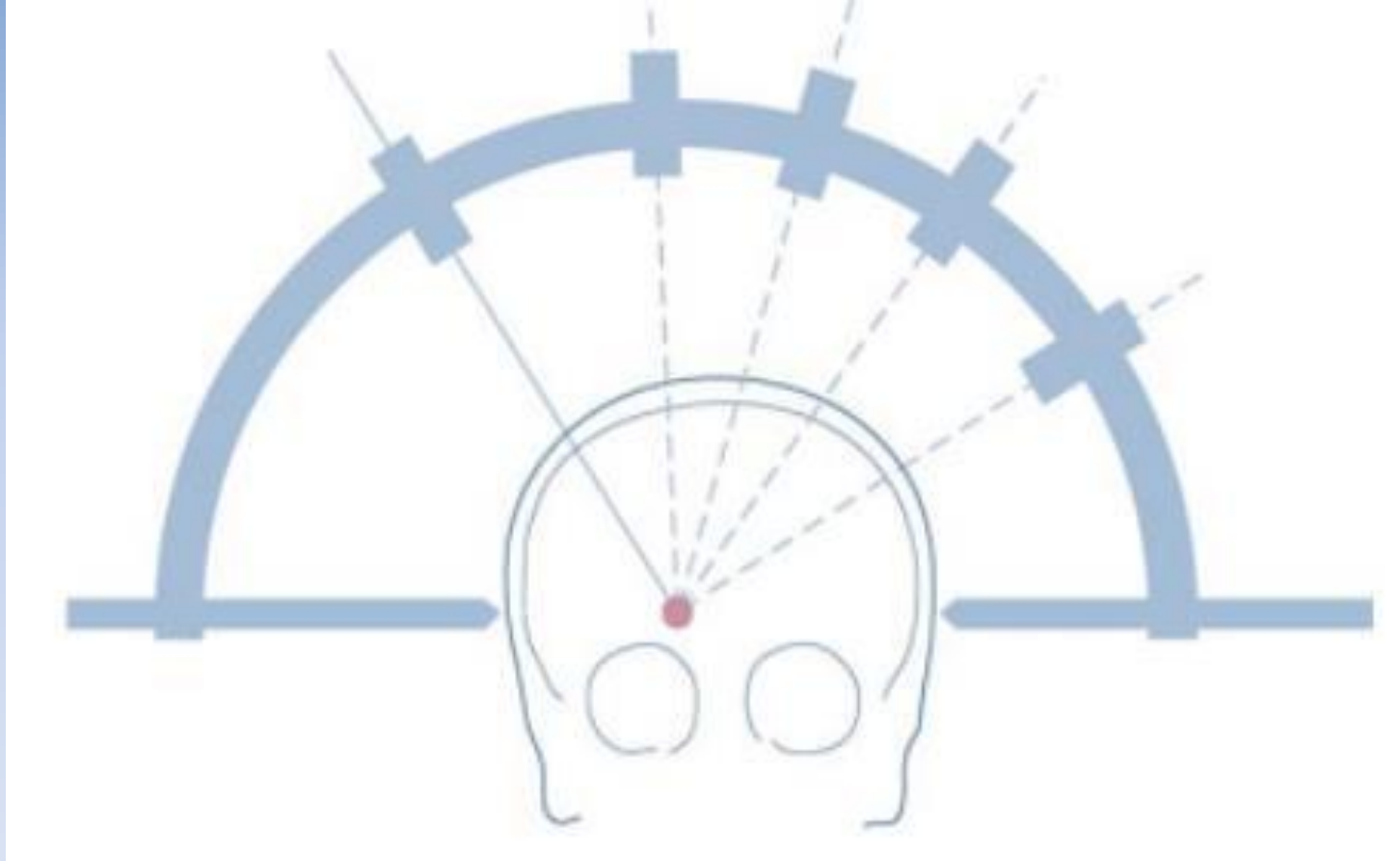
Functional Neurosurgery

- Movement disorders
 - Essential tremor, Parkinson disease, Dystonia
- Psychosurgery
 - OCD
 - Major depression
- Pain
- Epilepsy



*Cosman-
Roberts-Wells
Stereotactic
System

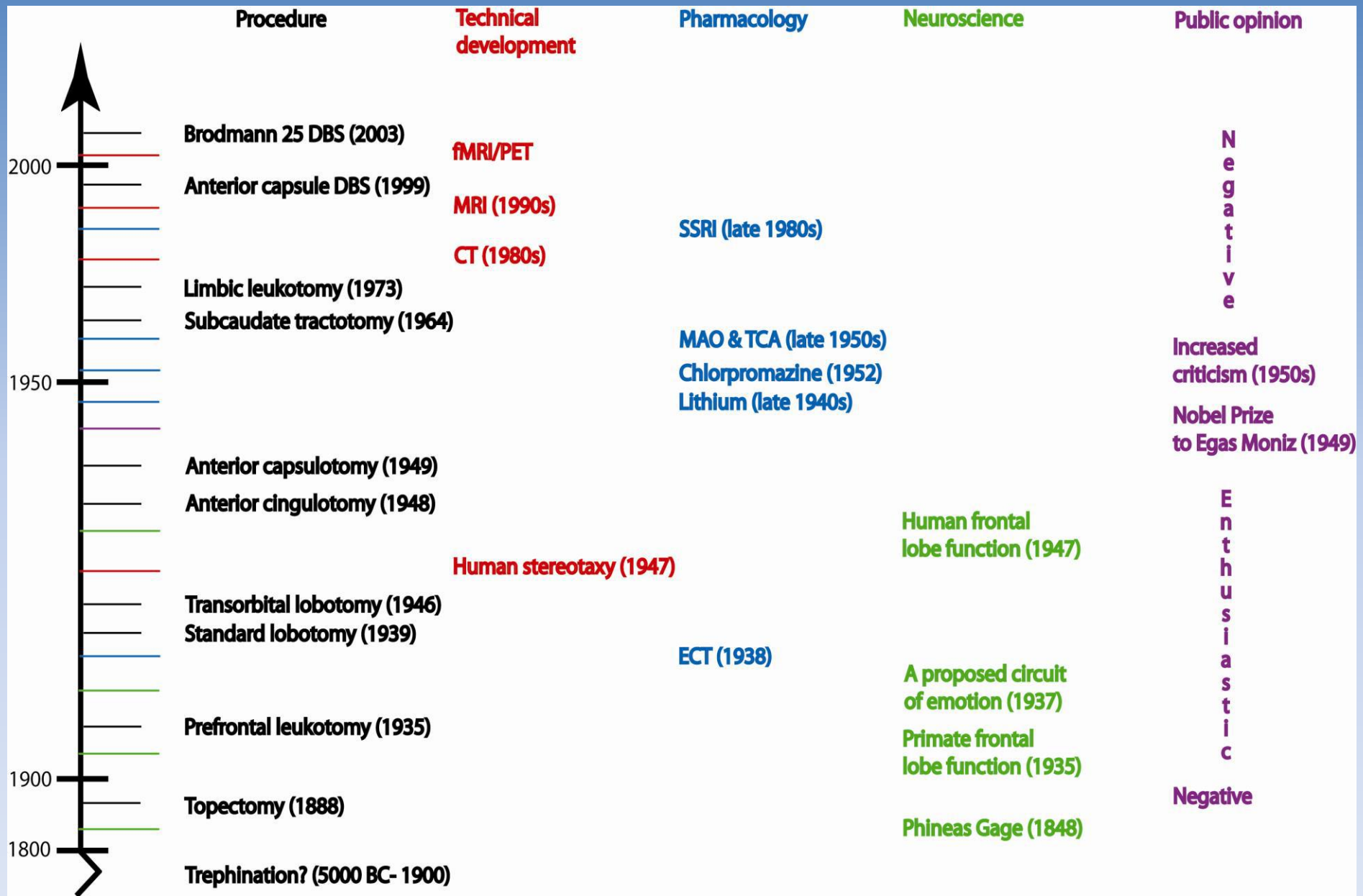
Arc-centered principle



History

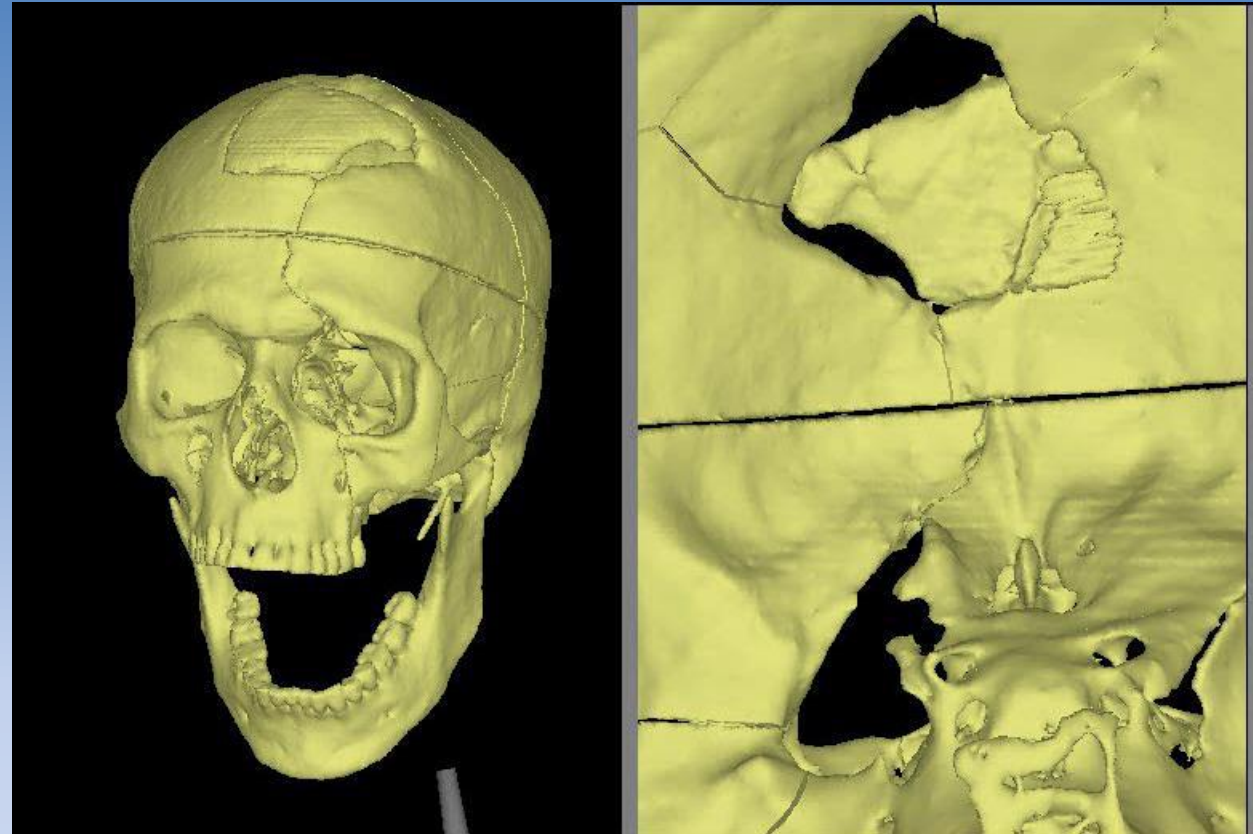
Outline

- Pre-history
- **Non**-stereotactic psychosurgery
- **Stereotactic ablative** psychosurgery
- **Old DBS** in psychiatry and behavior
- **Renaissance** of DBS in psychiatry





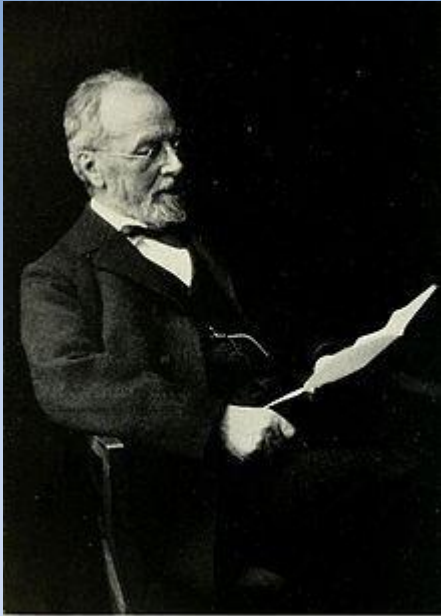
Hieronymus Bosch (1475?)



Ratnu & Talos (2004) N ENGL J MED 351;23



- First case to illustrate the importance of the frontal lobes
- Gage was no longer Gage



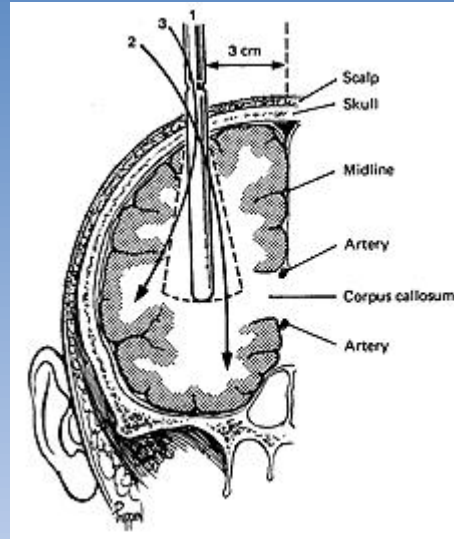
- **Gottlieb Burckhardt**
- Über rindexcisionen, als beitrage zur operativen therapie der psychosen, *Allg Z Psychiatr Psych Med* 47:463-548
- Excision of cerebrum at multiple foci in the frontal, parietal & temporal cortices
- 6 cases (3 successes, 3 failures)
- Presented in 1891 but not received favorably in Switzerland



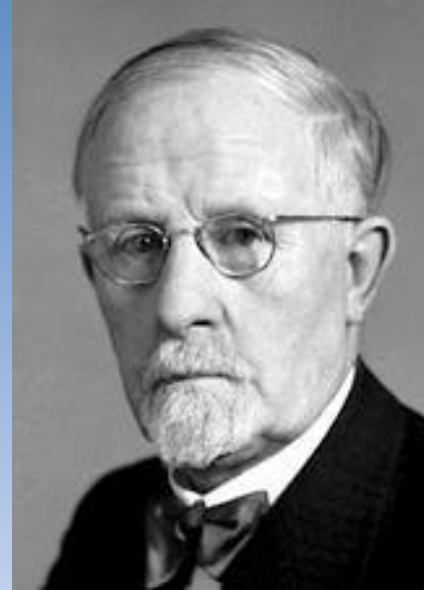
- Carlyle Jacobsen & John Fulton
- 2nd Int Congress of Neurology in 1935
- Study on short-term memory
- Frontal lobe resection resulted in increased cooperation and decreased aggression



- Egas Moniz (1874-1955)
- Attended the Fulton lecture
- Initiated together with Almeida Lima prefrontal leukotomy on psychiatric patients within the same year



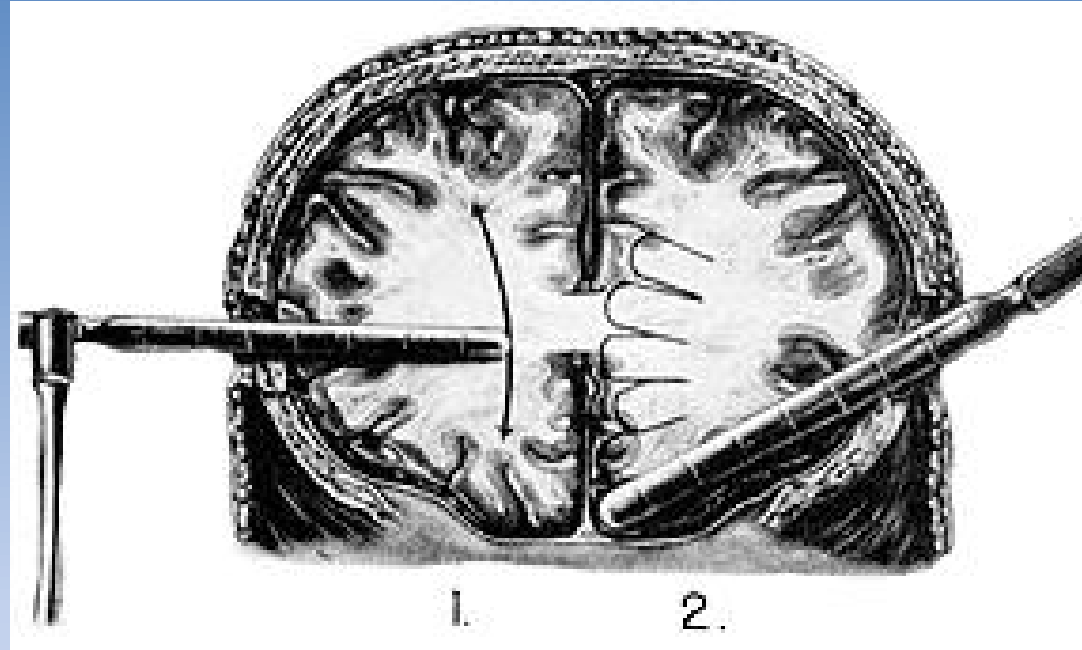
- Disconnecting the frontal lobes from the remaining part of the brain by destroying the white matter in centrum semiovale
- Lesions often too small to be "effective"
- Restricted to severe psychiatric cases



- The Nobel Prize in Physiology /Medicine 1949 divided between Egas Moniz and Walter Rudolf Hess
- Egas Moniz laurated "for his discovery of the therapeutic value of leucotomy in certain psychoses"



- Walter Freeman and James Watts
- Introduced and popularized psychosurgery in USA



- Modified the prefrontal leukotomy in order to produce more consistent results
- Adverse effects becoming evident



- Introduced and propagated by Freeman
- Faster than conventional lobotomy
- Could and were performed by non-surgeons

**”can be easily performed by the
psychiatrist himself with the tools he
might have in his pocket, and
strangely enough it may be harmless
and effective”**

Ørnulv Ødegård (1953)

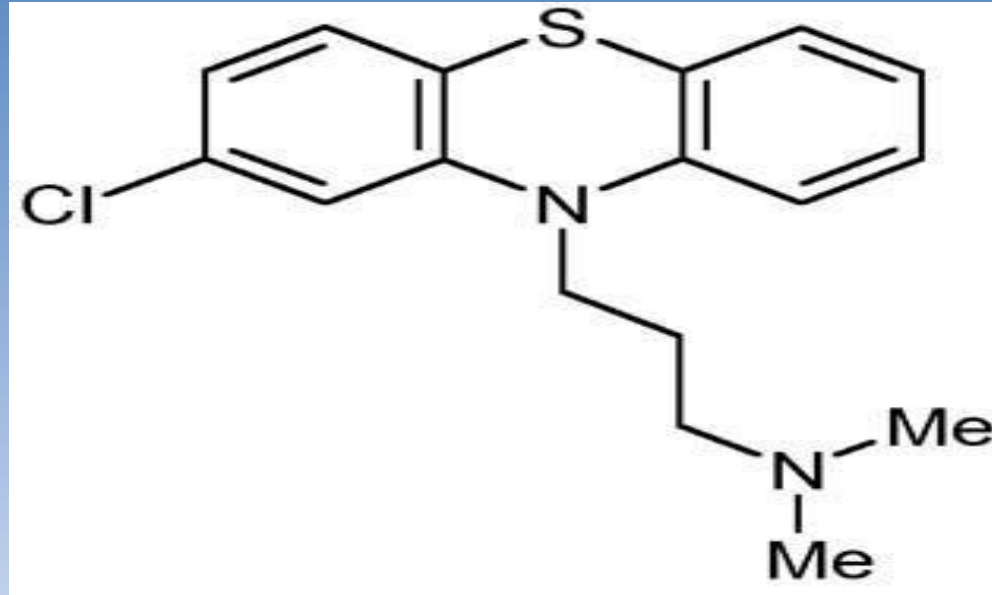
Nye framsteg i psykiatrien.
Tidsskrift for den Norske Lægeforening,
123;411-14



- Psychosurgery no longer last resort
- Primarily used on psychotic and aggressive patients
- Considerable mortality and morbidity



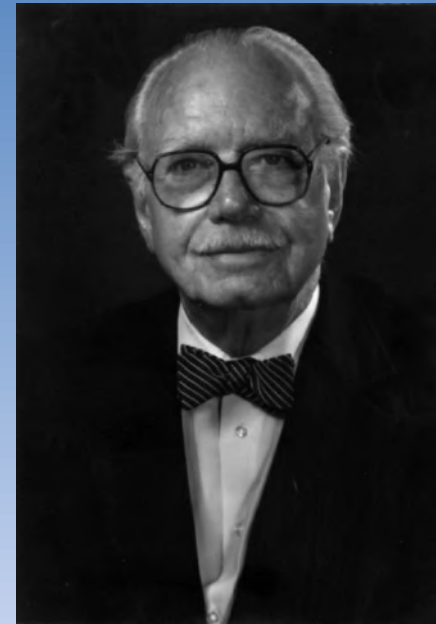
- Rosemary Kennedy (sister of JFK)
- Lobotomy due to seizures and violent mood swings
- Post lobotomy : unable to speak!



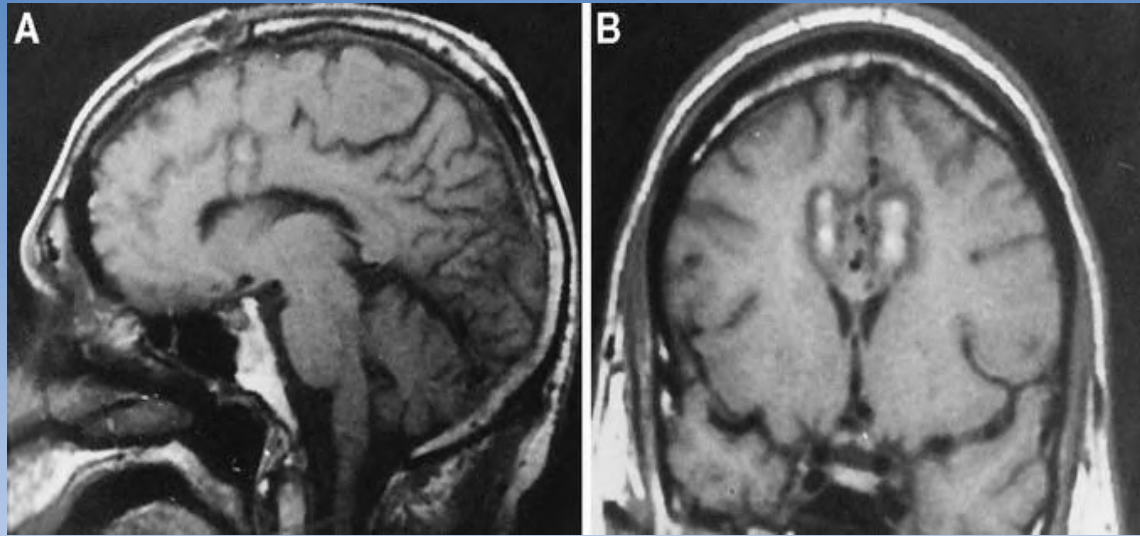
- Effective anti-psychotic drugs were introduced in the mid 1950s
- This combined with a change in the public opinion towards psychosurgery led to a fast decrease in the number of performed lobotomies

The number of performed lobotomies (1935-1970)

- 40,000 USA
- 15,000 UK
- 9000 (Scandinavian countries)



- Introduced by Sir Hugh Cairns (Oxford)
- Transformed to a stereotaxic procedure by H.T. Ballantine (USA)



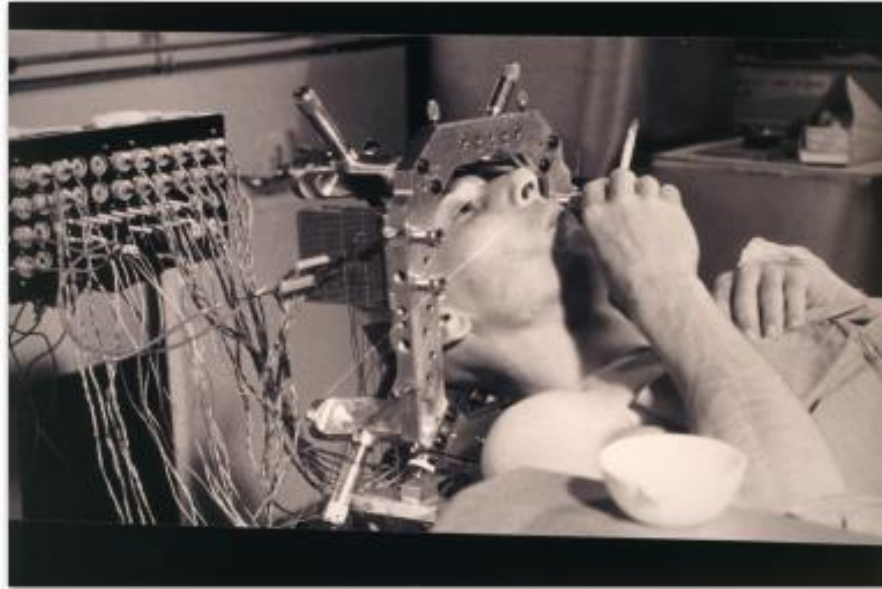
- Indicated towards treatment resistant major affective disorder, OCD and anxiety
- 60% may be improved
- Few side effects (seizures 1%, urinary incontinence, hemiplegia 0.3%) but (suicide 9%)
- 40-50% required more than one operation



- Introduced by Jean Talairach (France)
- Lars Leksell propagated the procedure in Sweden

The 1949 Talairach Prototype Frame

The Grid Principle



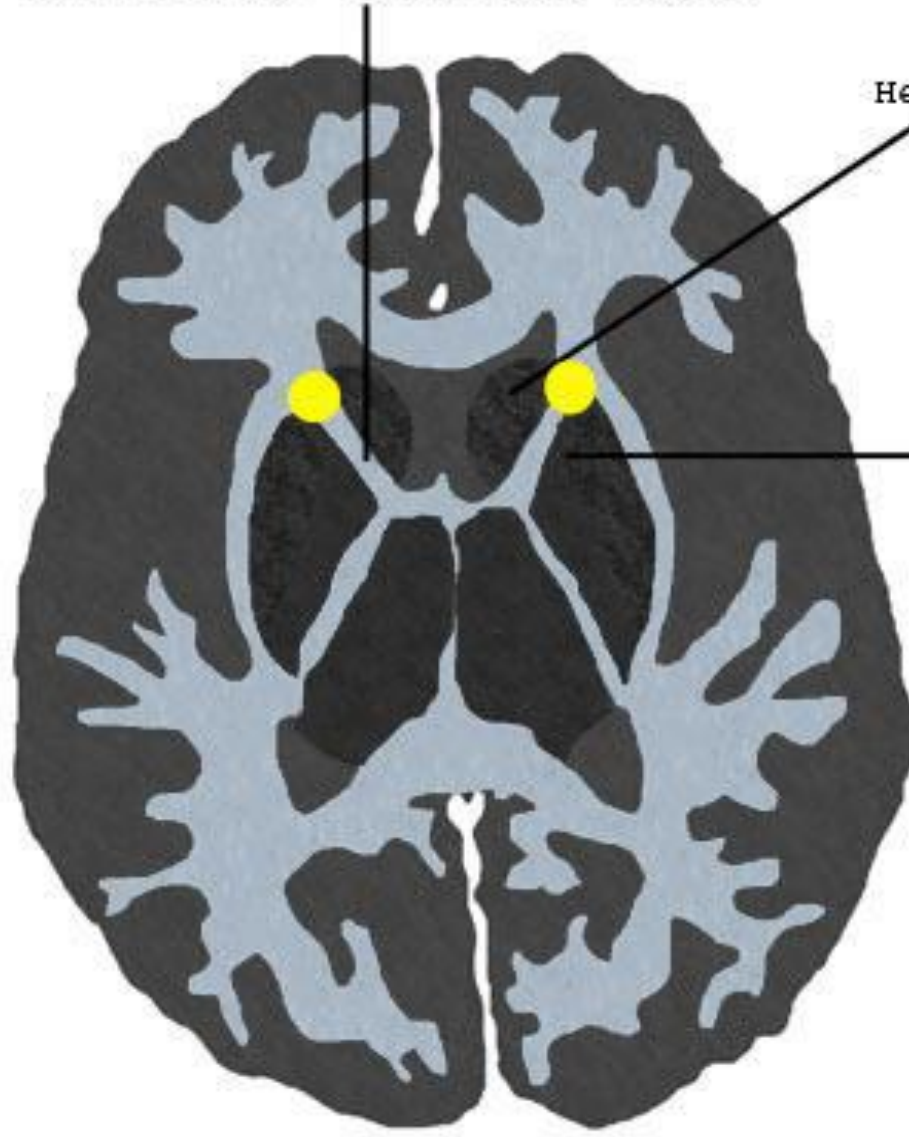
A basic unit is fixed to the skull and a double grid is attached to that base unit. Collimated radiographs obtained with the grid in place, demonstrated superimposition Of the holes in the grid over a positive contrast ventriculogram. Talairach reported the clinical use of the stereotactic thalamotomy and anterior capsulotomy in the treatment respectively of thalamic pain and mental disease. Talairach also introduced the concept of **teleradiography** And **AC PC line** ...



Anterior Limb of Internal Capsule

Head of Caudate
Nucleus

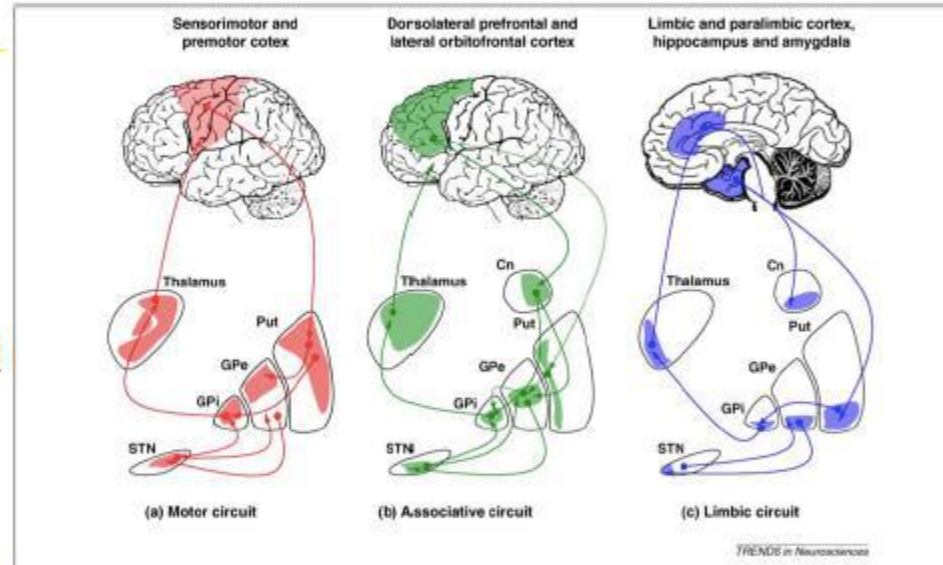
Basal
Ganglia



Nucleus Accumbens

Nucleus accumbens

1. The biggest part of the ventral striatum (VS)
 - relay within the limbic and prefrontal loops
 - Involved in emotional and cognitive functions
 - role in motivation, and reward
 - target under exploration in psychiatric disorders



Adapted from Krack et al. Trends in Neurosciences, 2010

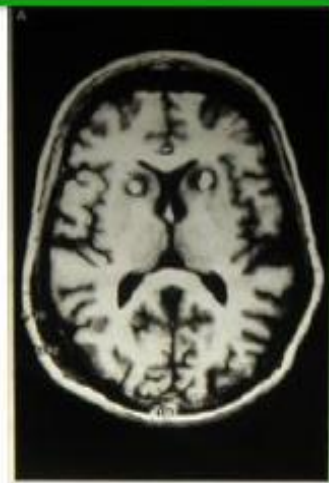
Surgery for Psychiatric Disorders - Current Indications

- Severe, incapacitating psychiatric illness!
 - Major Depression (BDI > 30, GAF < 50)
 - Obsessive Compulsive Disorder (YBOCS > 25-30)
 - Other
- Refractory to all conventional treatment
 - pharmacotherapy
 - behavioral therapy
 - ECT

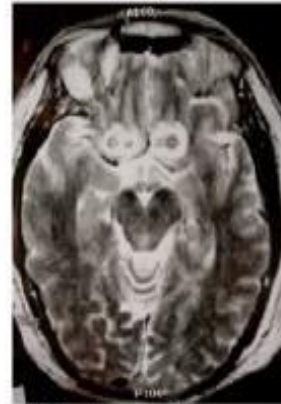
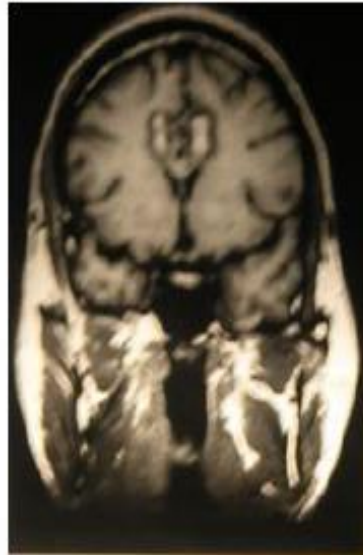
Outcome Measurement OCD

- Responder
 > 35% improvement in YBOCS
- Partial Responder
 25 - 34% improvement in YBOCS
- Non-Responder

Various stereotactic lesional procedures for OCD



capsulotomy



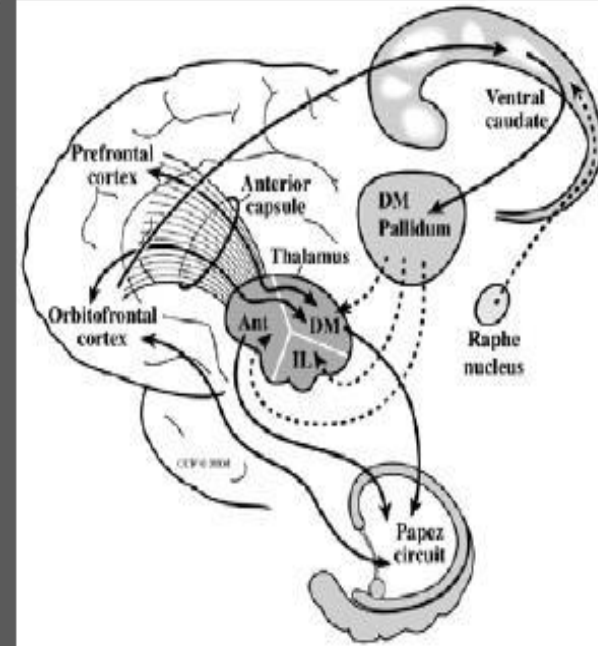
Subcaudate tractotomy



cingulotomy



Limbic leucotomy

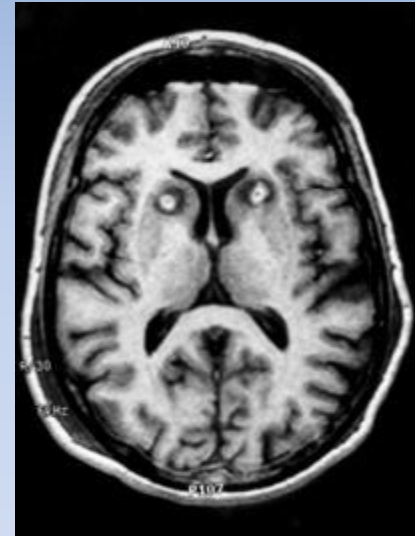


From:
Koppel, Greenberg
and Rezai, J Clin
Neurophysiol., 21:
56-67, 2004



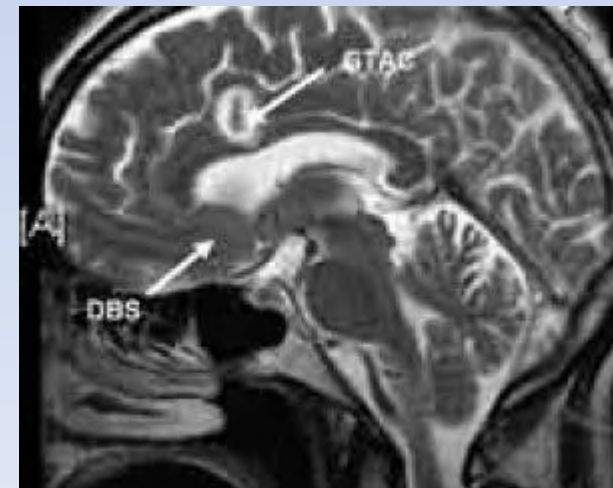
Anterior capsulotomy

- Bilateral lesions to the anterior limb of the internal capsule
- Severing connections between **midline thalamic nuclei, caudate nuclei, and the orbitofrontal cortex,**
- More effective than alternative procedures for the treatment of **GAD** and **OCD**.

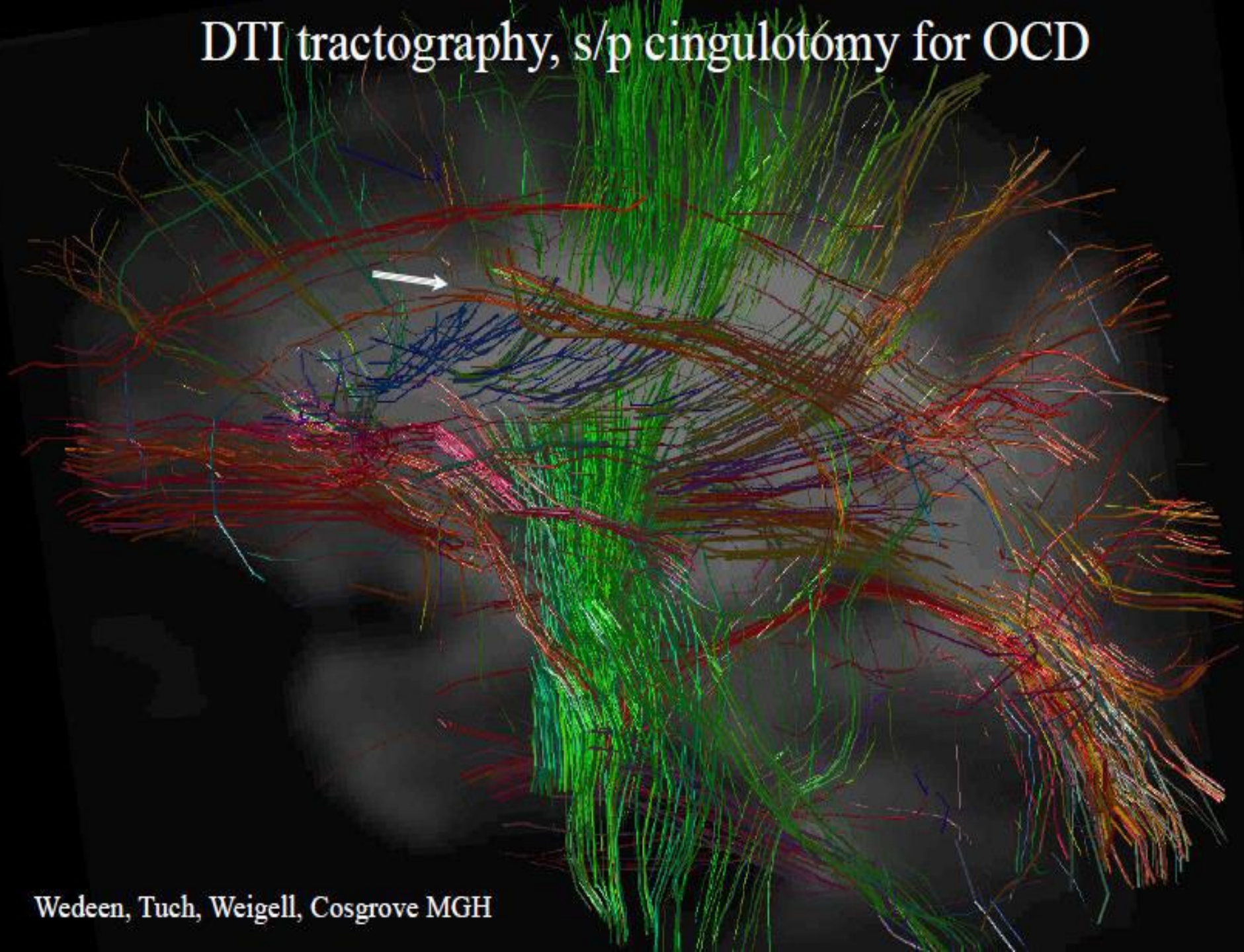


Anterior Cingulotomy

- Bilateral lesions to the anterior cingulate gyrus,
- Severing the cingulum bundle
- More effective than alternative procedures for the treatment of **bipolar disorder, depression, and schizoaffective disorder**. Also for **Schizophrenia**.



DTI tractography, s/p cingulotomy for OCD



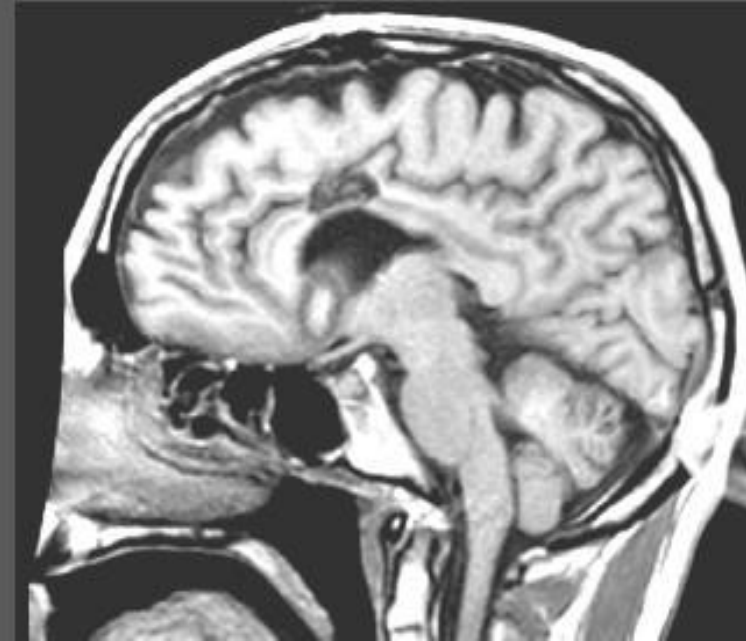
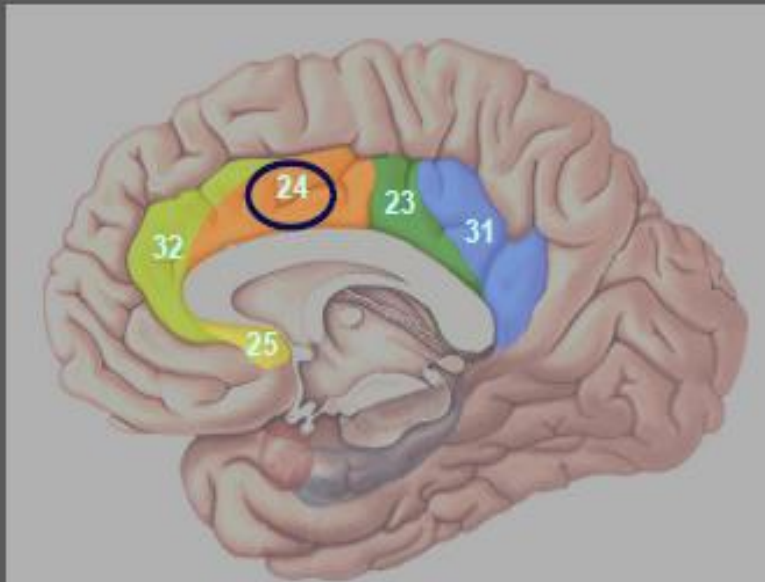
Wedeen, Tuch, Weigell, Cosgrove MGH



MGH Cingulotomy Experience for MDD

Shields et al, Biol Psychiatry 64:449, 2008

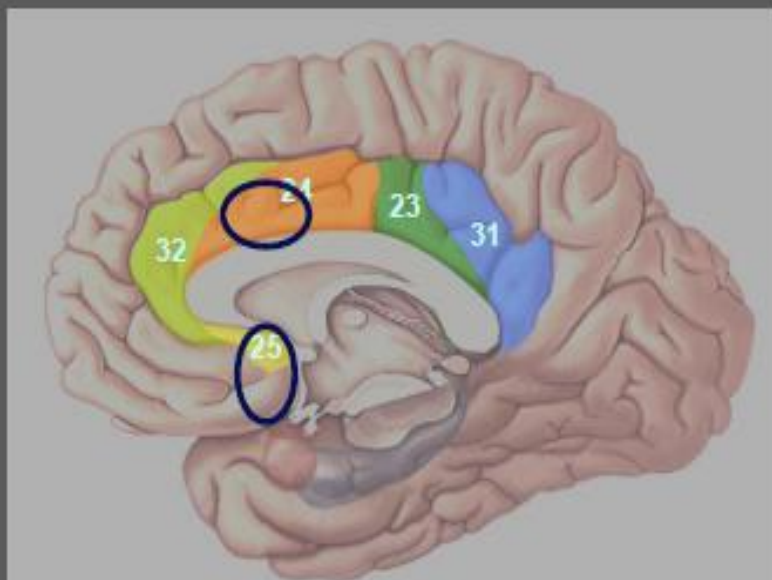
- N = 33 pts, F/U @ 42 mos
 - Responders33% → 75%
 - Partial responders 42%



MGH Cingulotomy for OCD (1989 - 2009)

Sheth, Dougherty, Eskandar, Cosgrove et al, (in press)

- N = 64 pts, at last F/U @ 62 mos
 - Responders49% → 69%
 - Partial responders 22%

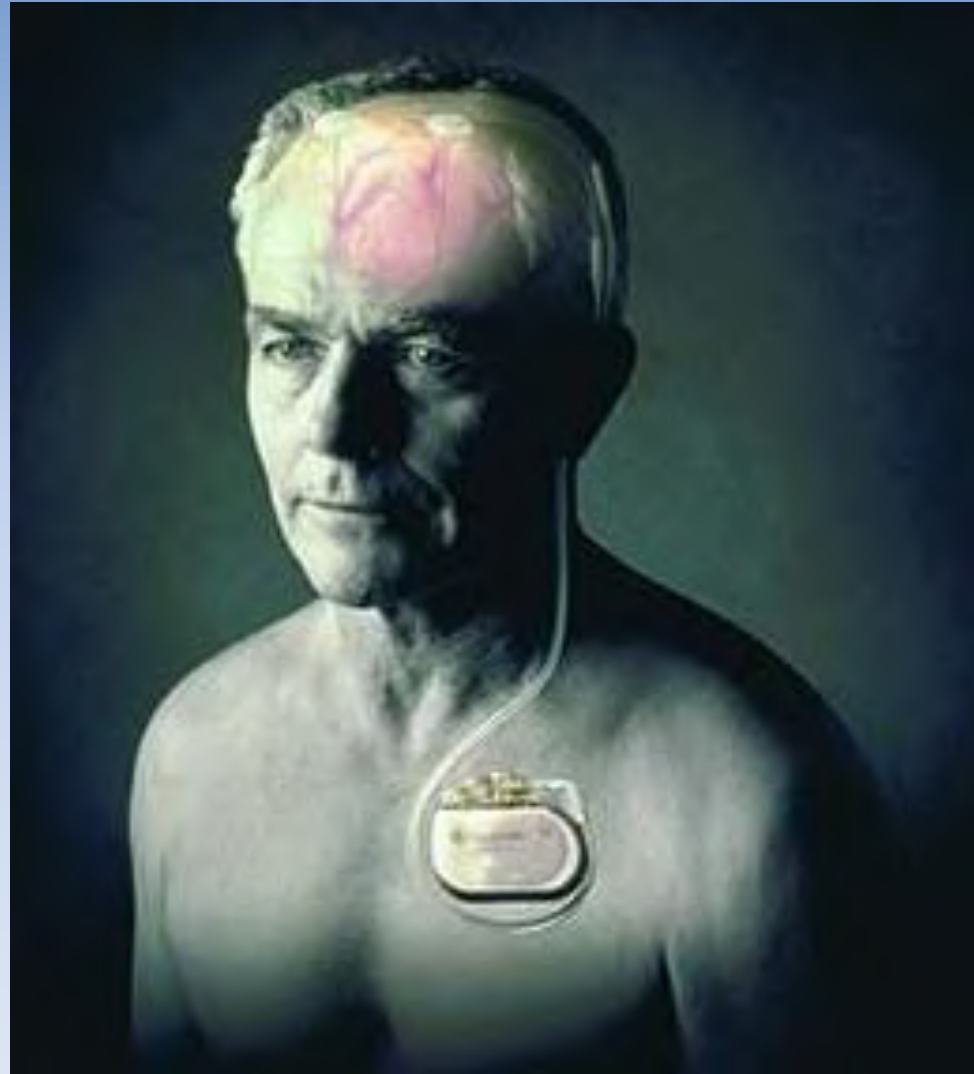


Mean YBOCS Improvement

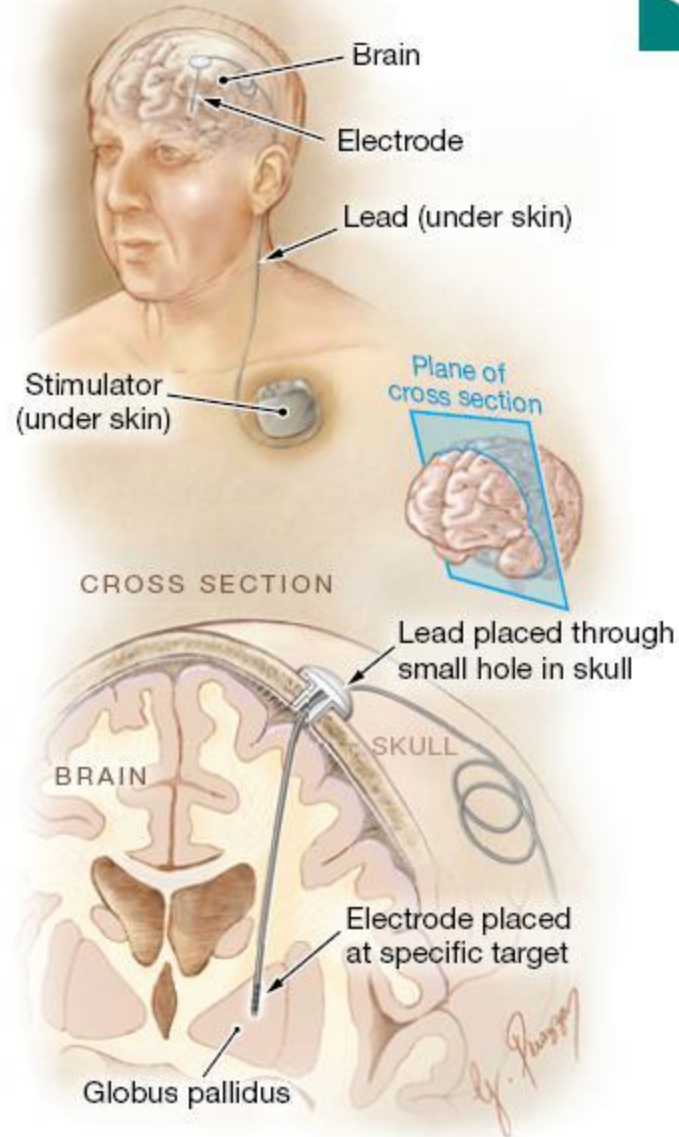
36%



Deep Brain Stimulation



Deep Brain Stimulation in Individual With Parkinson Disease



NeuroMaPC

Center for Neuromodulation and Pain



Deep Brain Stimulation

1980	Benabid VIM DBS
1982-1994	Siegfried & Lippitz Chronic electrical stimulation of the VL-VPL and Pallidum
1990's	Benabid high frequency stimulation of the STN STN became the primary target in PD Velasco Prelemniscal radiation stimulation (target just lateral to the old campotomy target)
2002	US Approval for STN DBS
1990's	Reintroduction of Gpi lesioning Frequent side effect when performed bilaterally Gpi DBS for cervical dystonia and generalized dystonia



Humanitarian Device Exemption (HDE)

» FDA Home » Medical Devices » Databases



510(k) | DeNovo | Registration & Listing | Adverse Events | Recalls | PMA | HDE | Classification | Standards
CFR Title 21 | Radiation-Emitting Products | X-Ray Assembler | Medsun Reports | CLIA | TPLC

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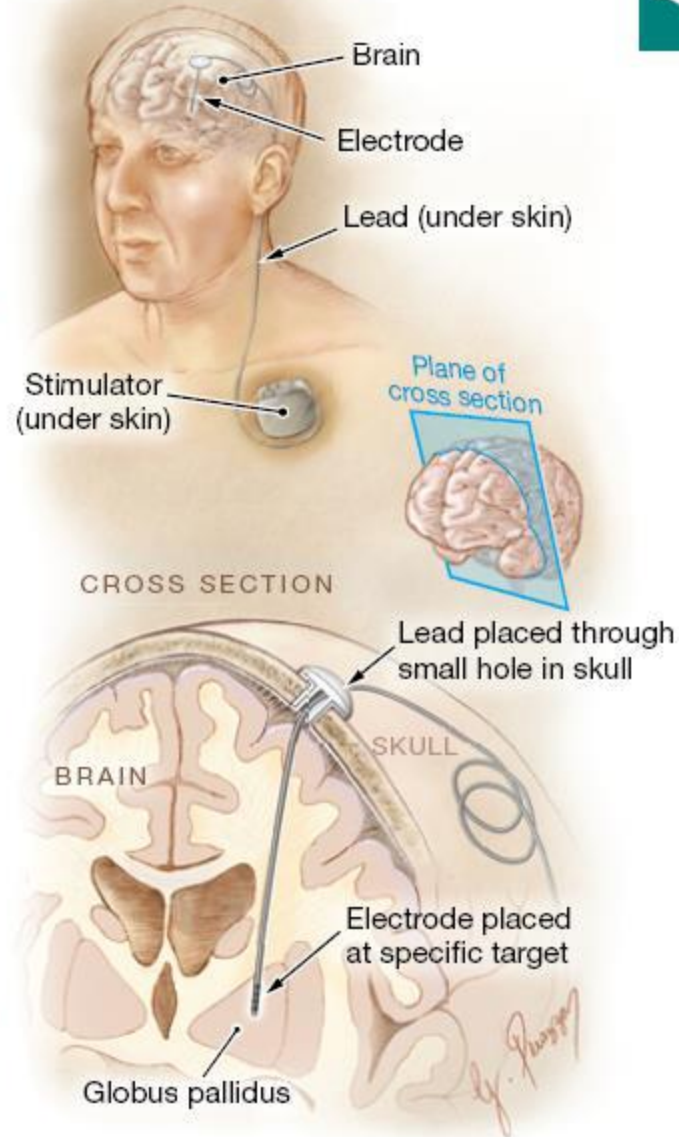
[Back to Search Results](#)

Note: this medical device has supplements. The device description may have changed. Be sure to look at the supplements to get an up-to-date view of this device.

Trade Name	MEDTRONIC (ACTIVA)DEEP BRAIN STIMULATION FOR OCD THERAPY
Classification Name	Deep Brain Stimulator For Obsessive Compulsive Disorder (Ocd)
Generic Name	Deep Brain Stimulator For Obsessive Compulsive Disorder (Ocd)
Applicant	MEDTRONIC INC.,NEUROLOGICAL DIVISION 7000 Central Avenue Northeast Minneapolis, MN 55432
HDE Number	H050003
Date Received	10/31/2005
Decision Date	02/10/2009
Product Code	OLM [Registered Establishments With OLM]
Docket Number	09M-0090
Advisory Committee	Neurology
Supplement Type	Hde Original
Expedited Review Granted?	No

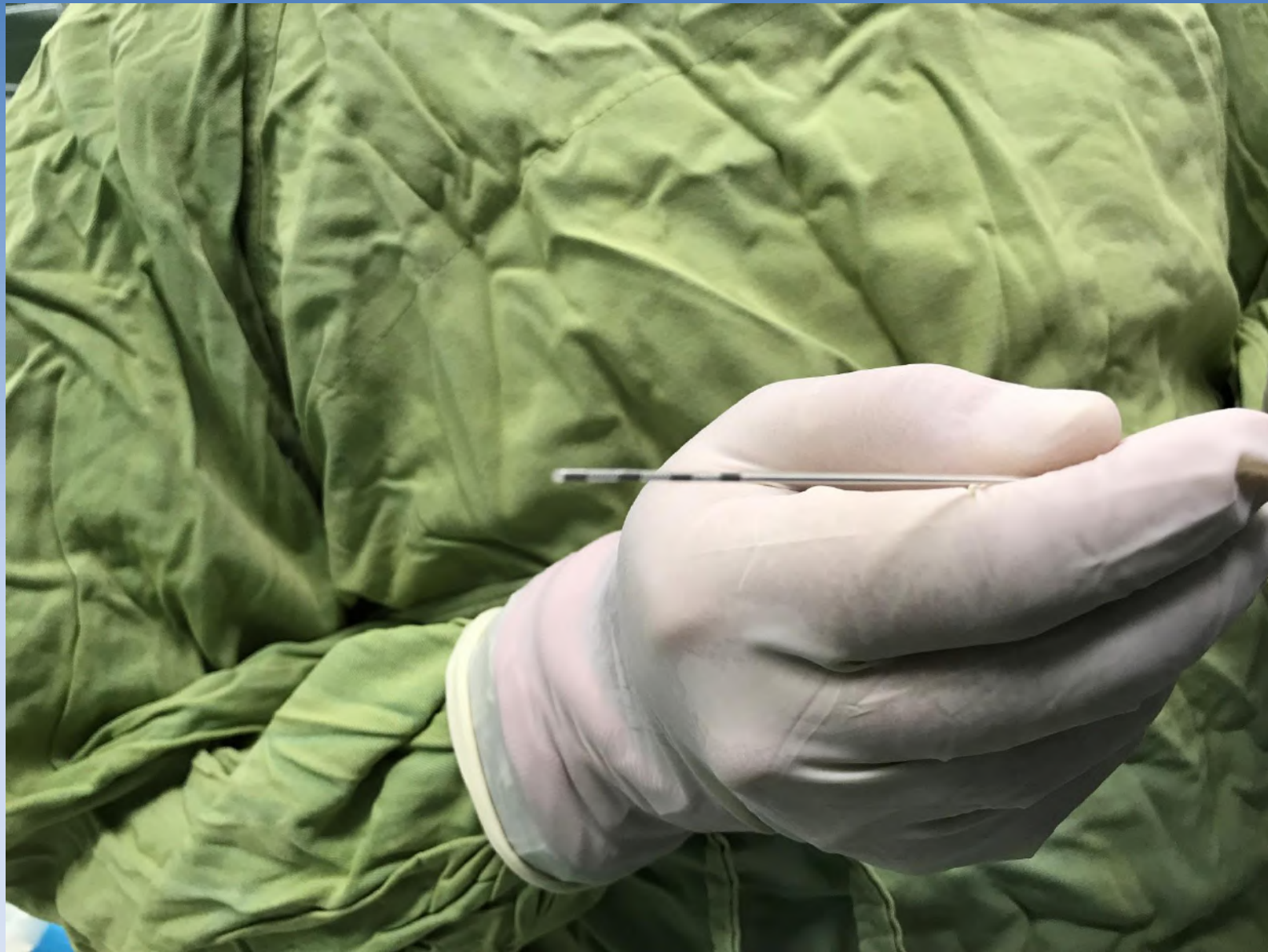


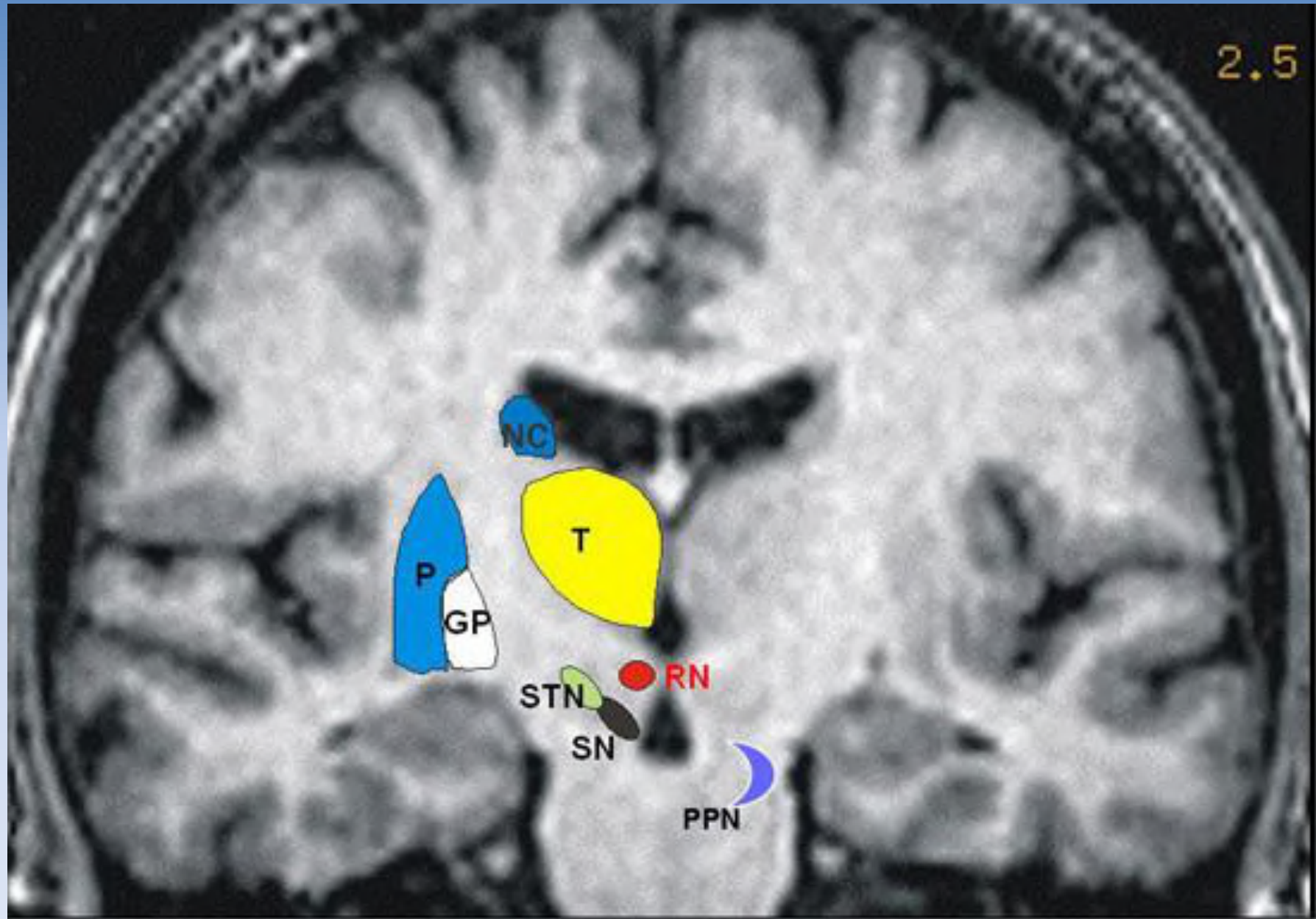
Deep Brain Stimulation in Individual With Parkinson Disease



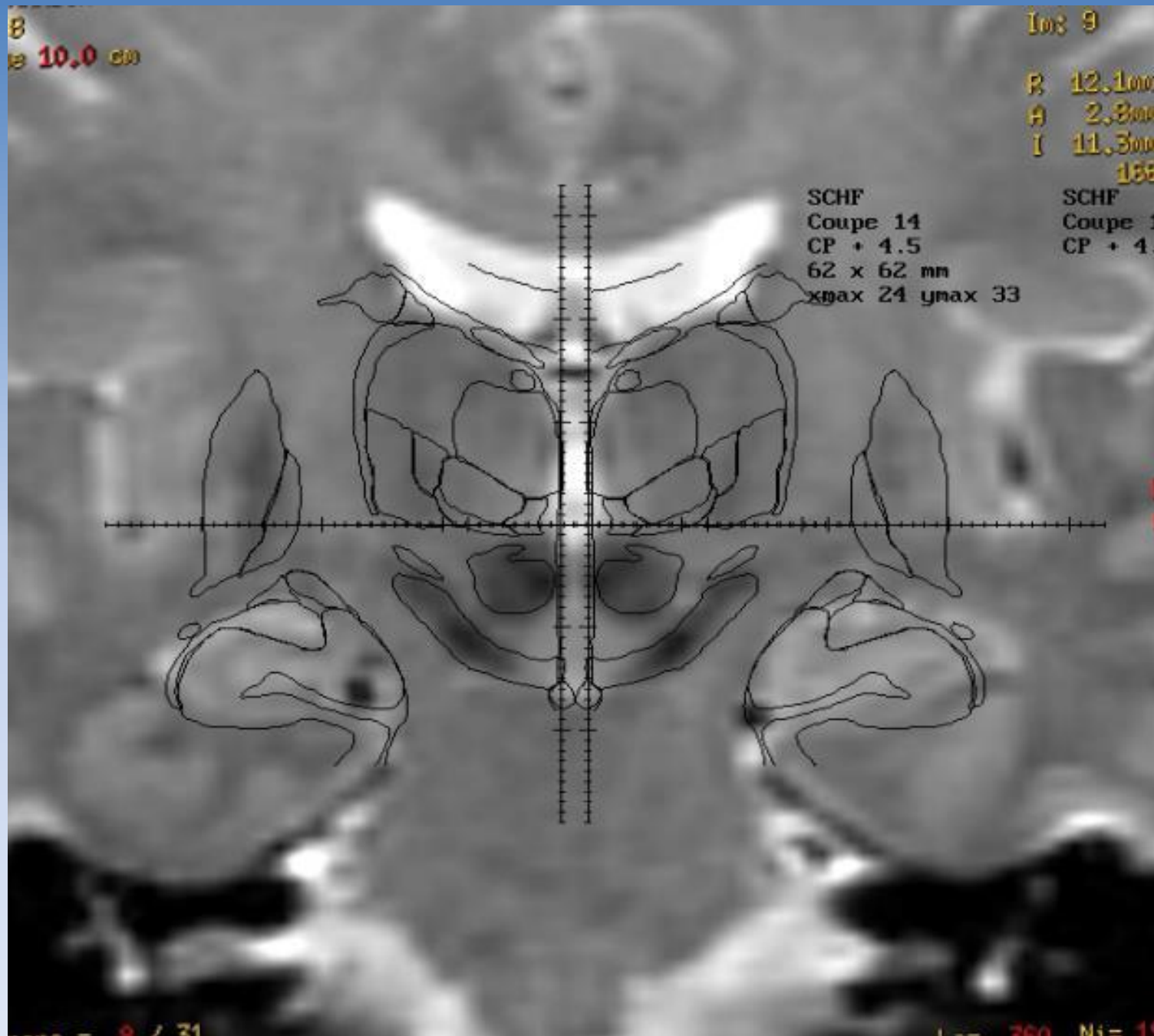
NeuroMaPC

Center for Neuromodulation and Pain

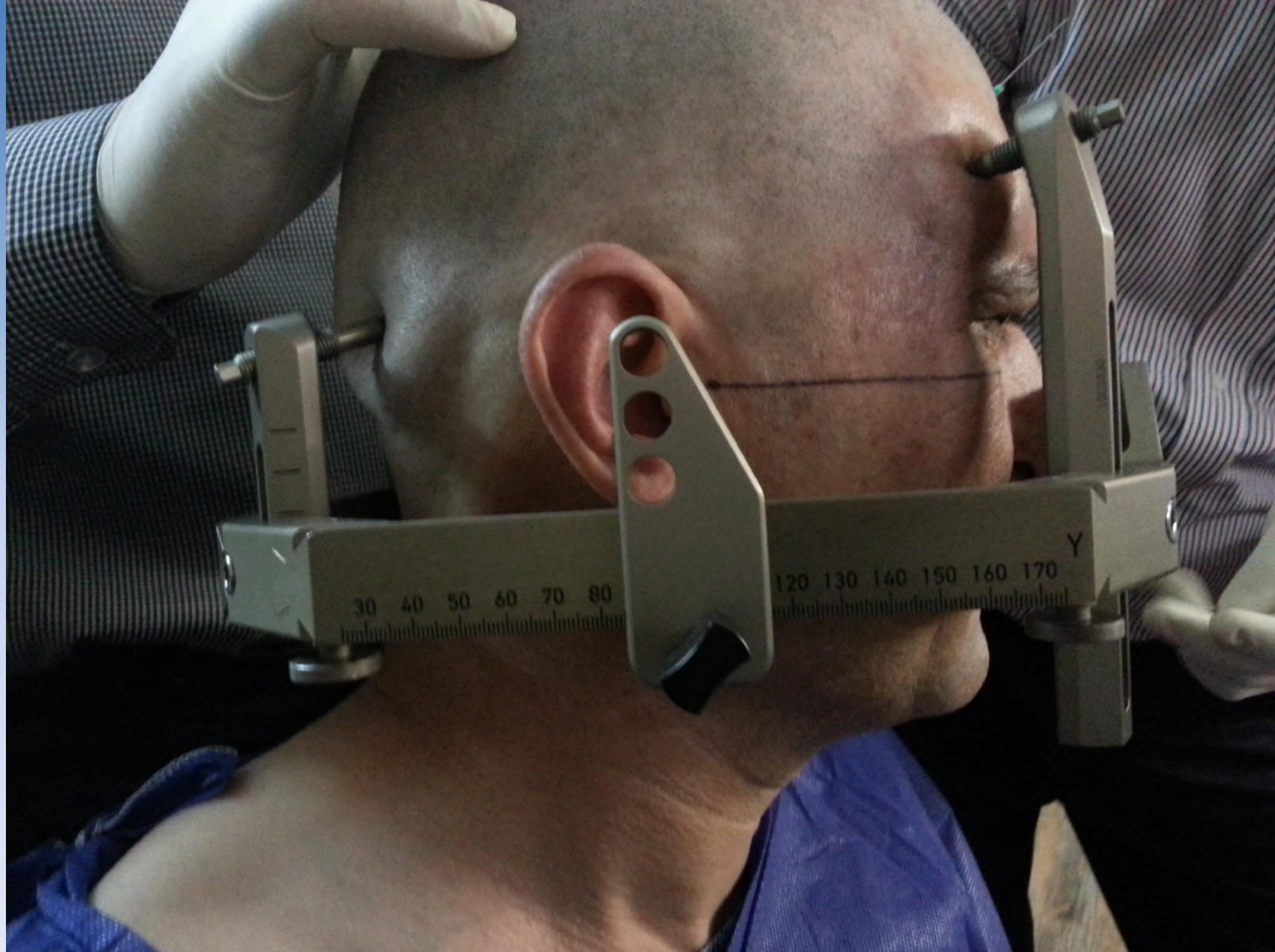






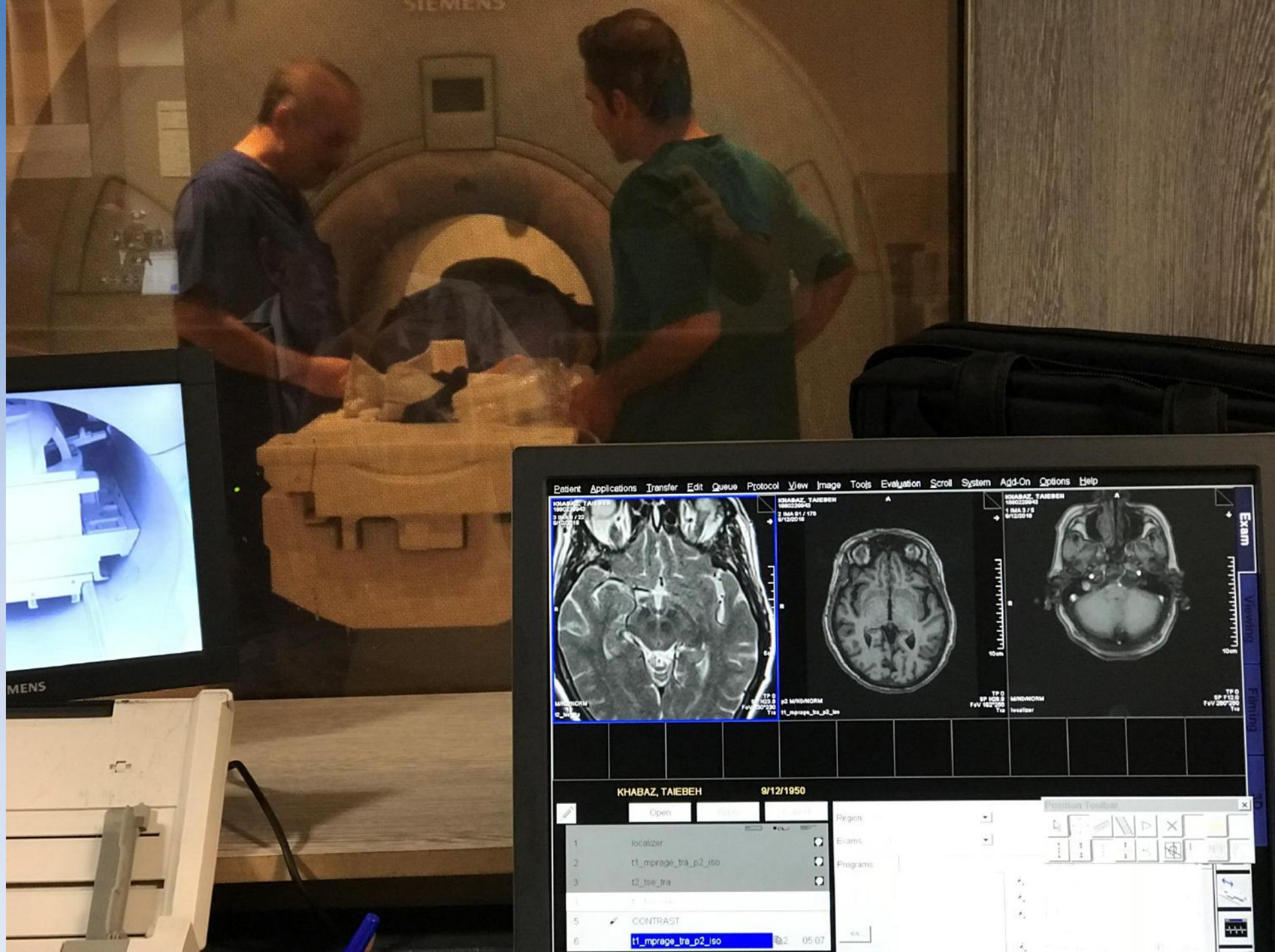


Surgical Procedure

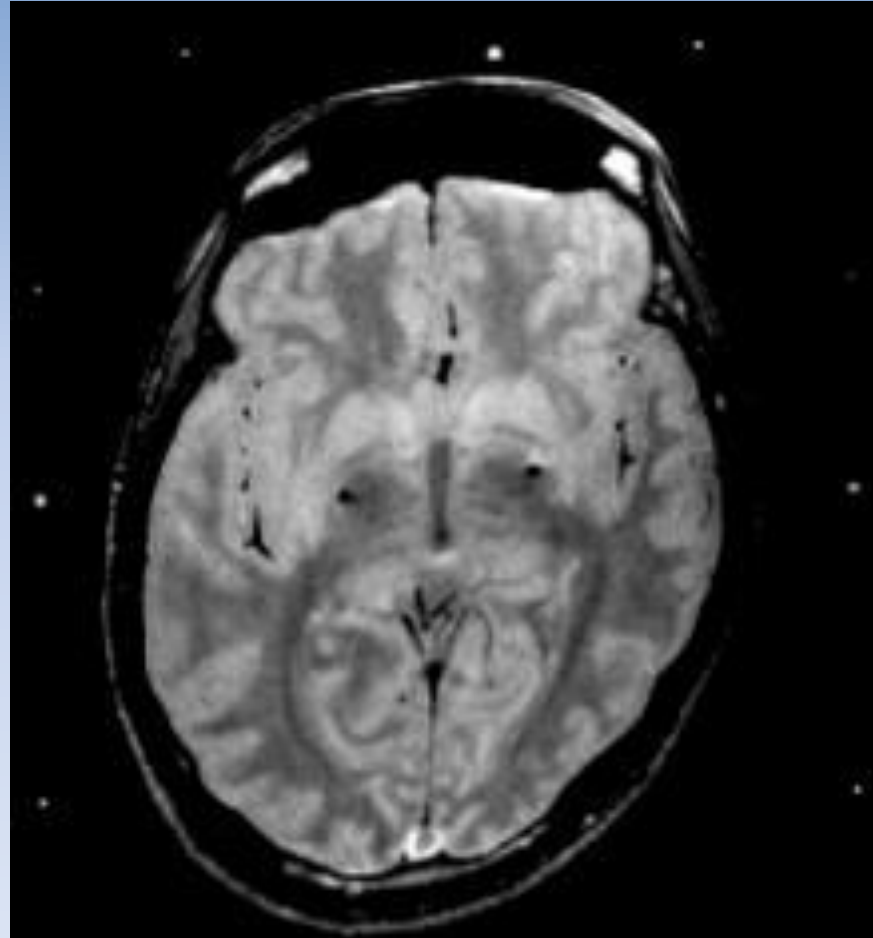








MR Distortion



Medtronic

Planning

KARIMI SHAHJAN
Stereotactic Frame DBS

CORONAL

AXIAL

Lat: 0.3
A-P: 6.2
Vert: -53.3

Plans

UNDO DELETE ALL SHOW ALL

Rt Stn

0.0 mm TO TARGET

0.0 mm Off Plan

65.7 mm

ENTRY TARGET

AC-PC FRAME

SELECT

Origin: MCP

Lat: 11.68 mm ± 0.46 % x 25.33

A-P: -3.49 mm ± -0.14 % x 25.33

Vert: -3.54 mm ± -0.14 % x 25.33

22.3° from mid-Sagittal Plane
61.6° from Axial Plane

Lt Stn

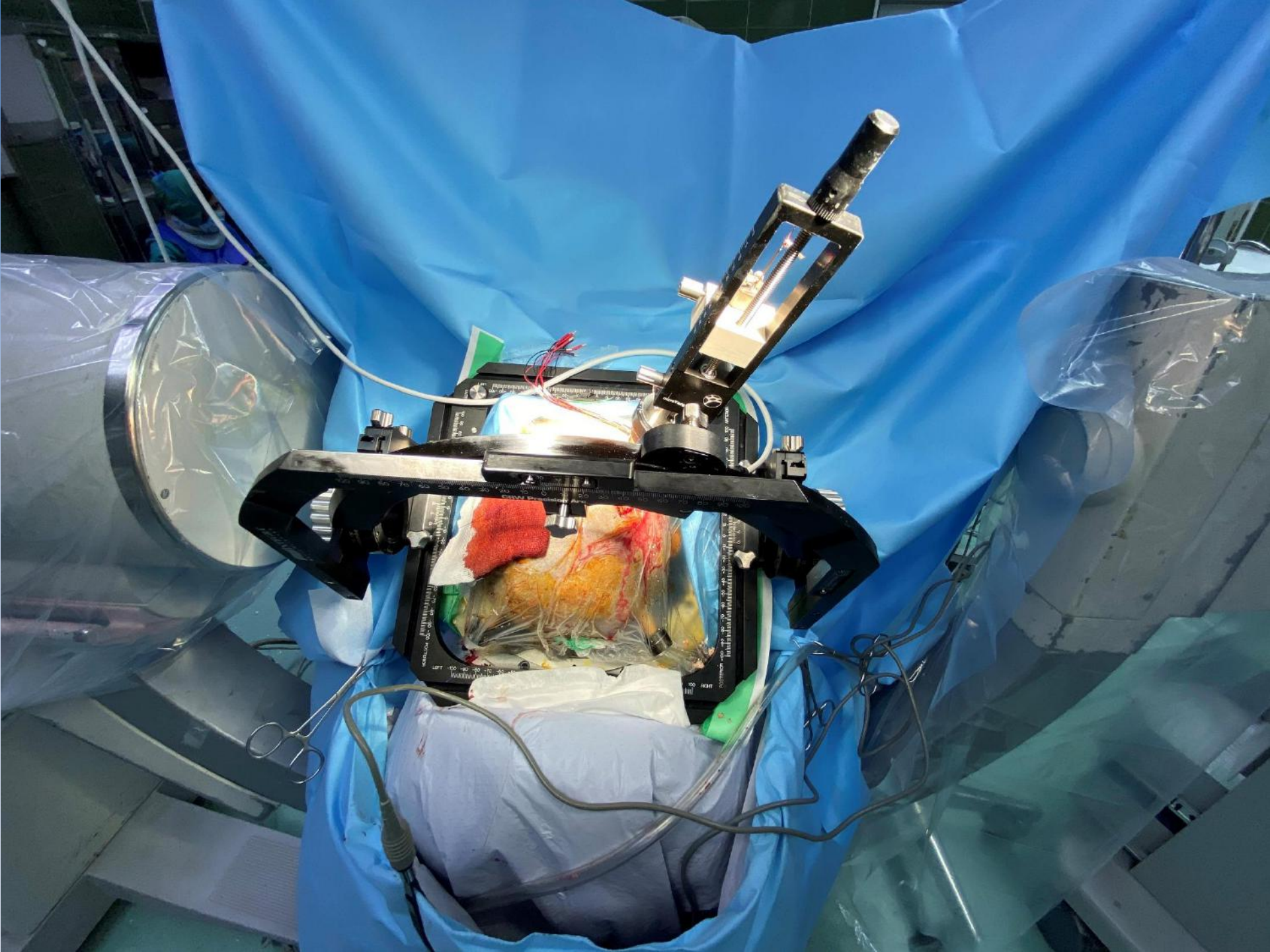
Rt Stn - Imed

Rt Stn - 2

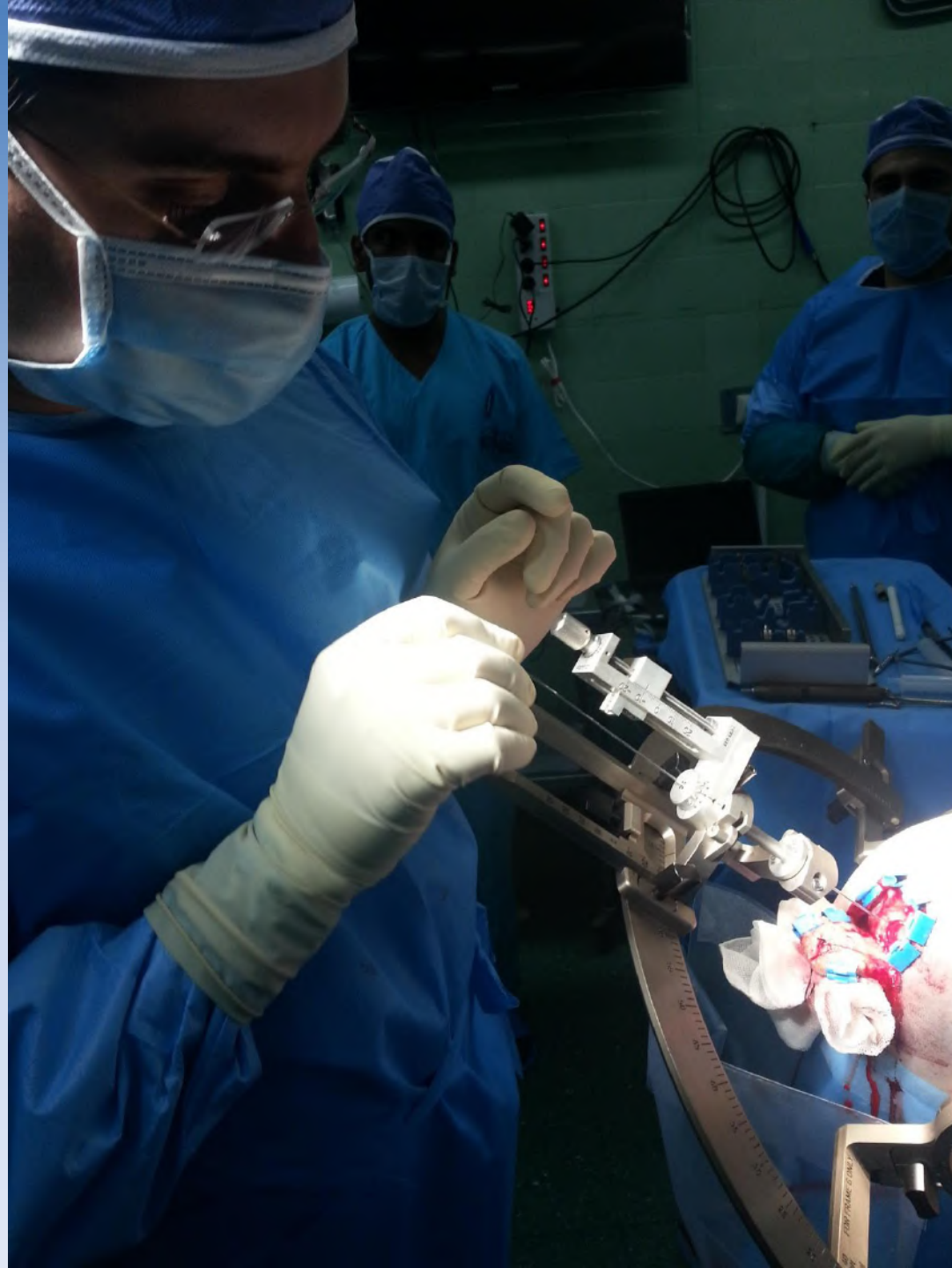
STEREOTACTIC

Medtronic

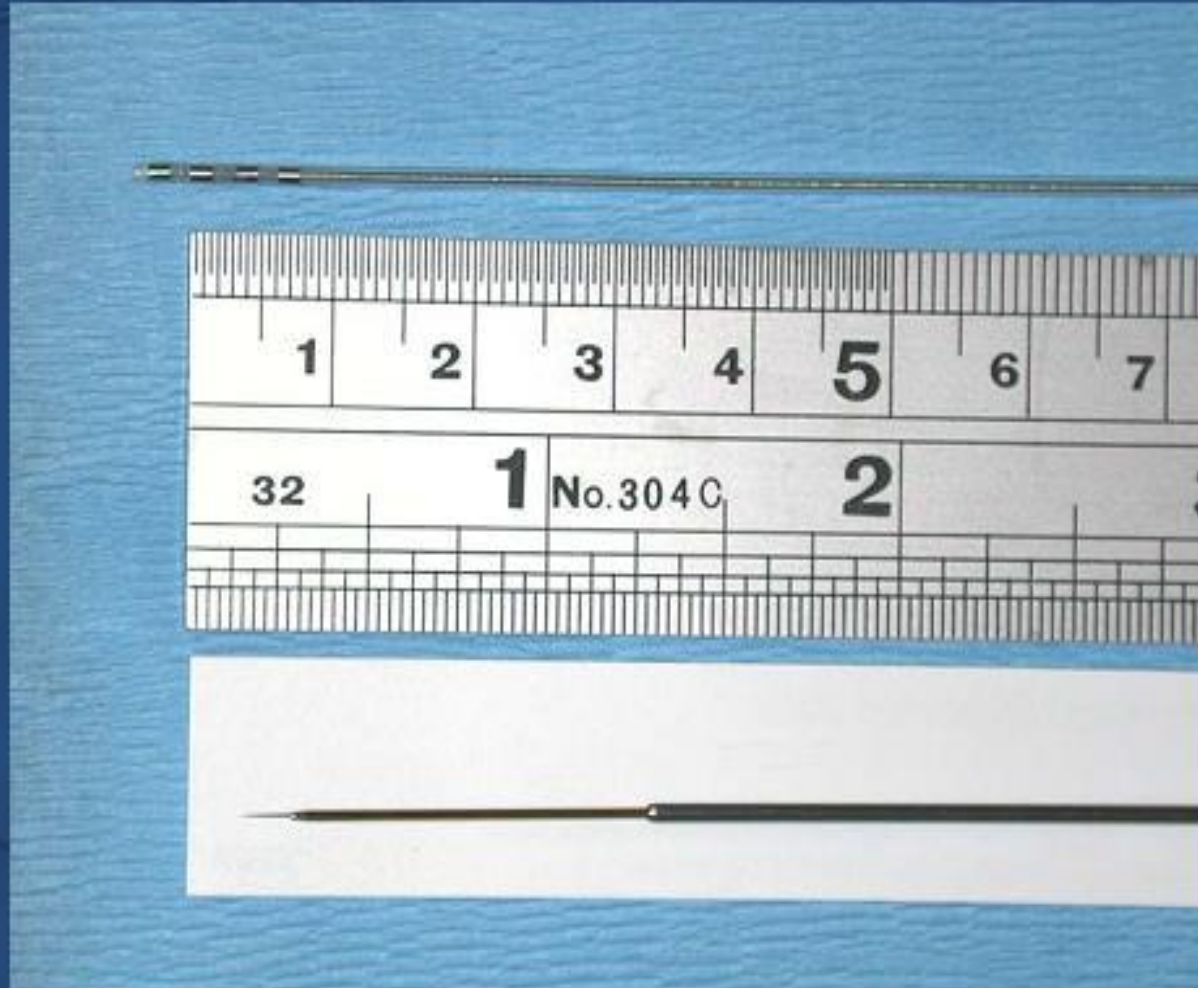


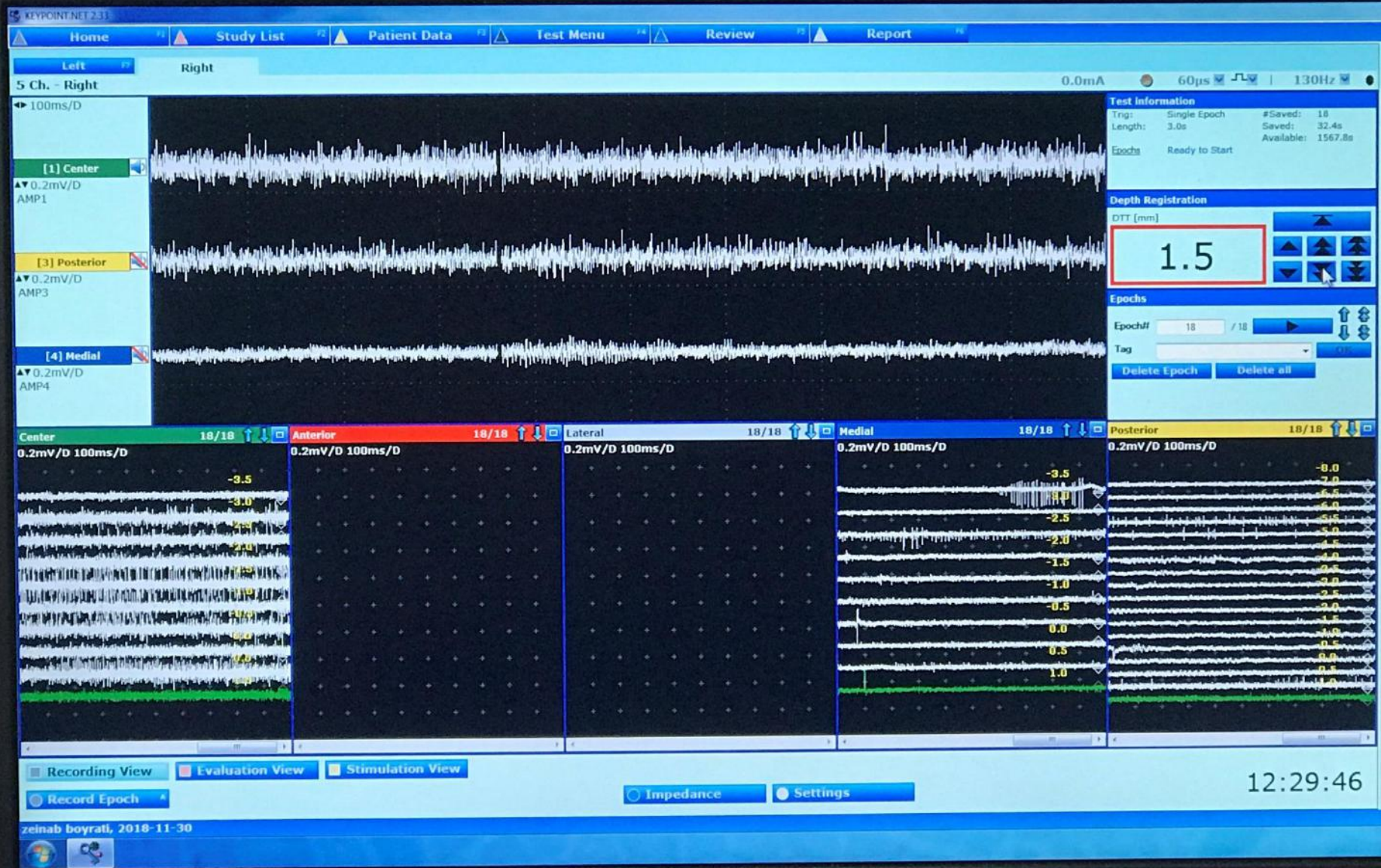




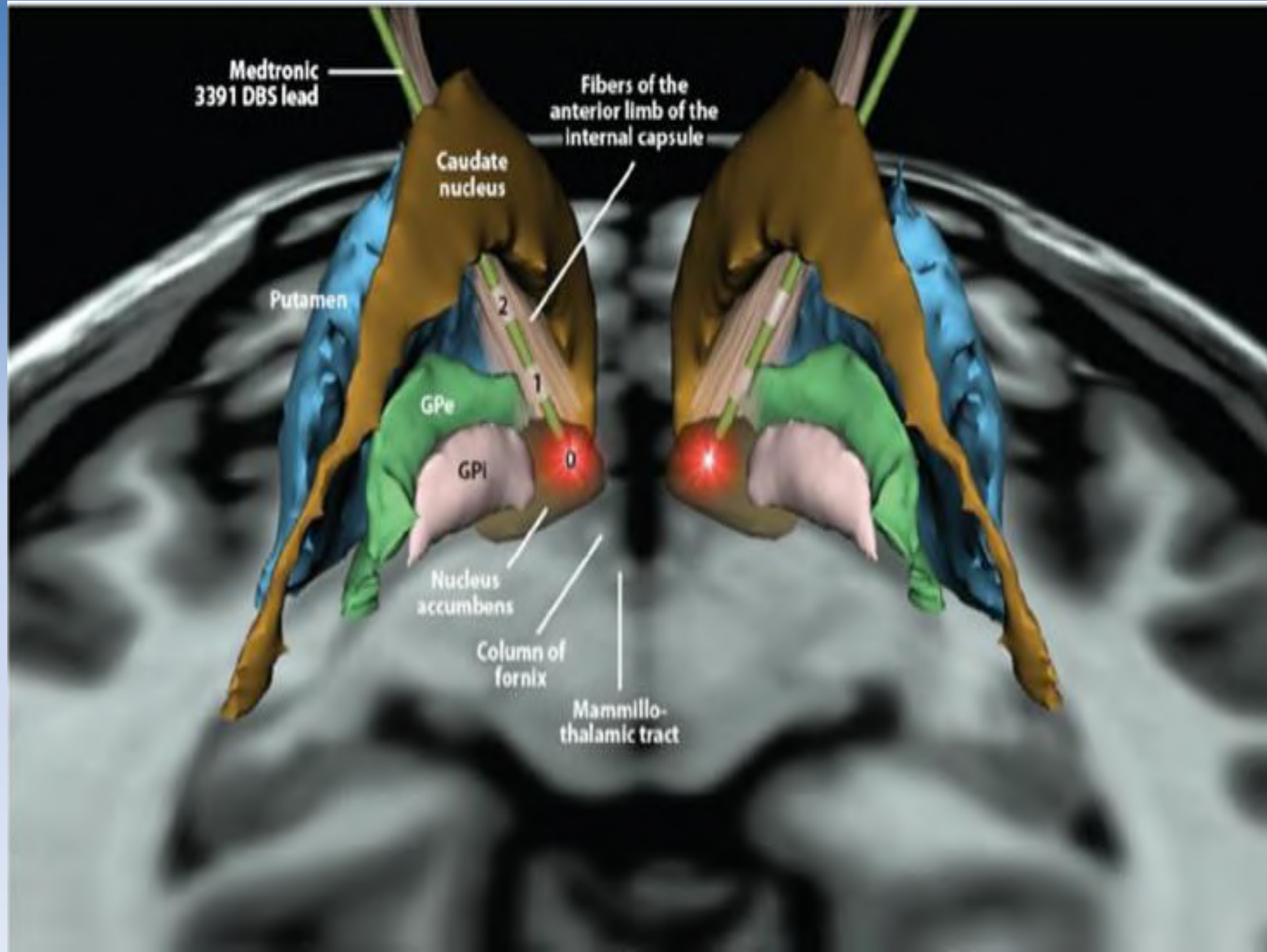


Microelectrode and DBS Electrode

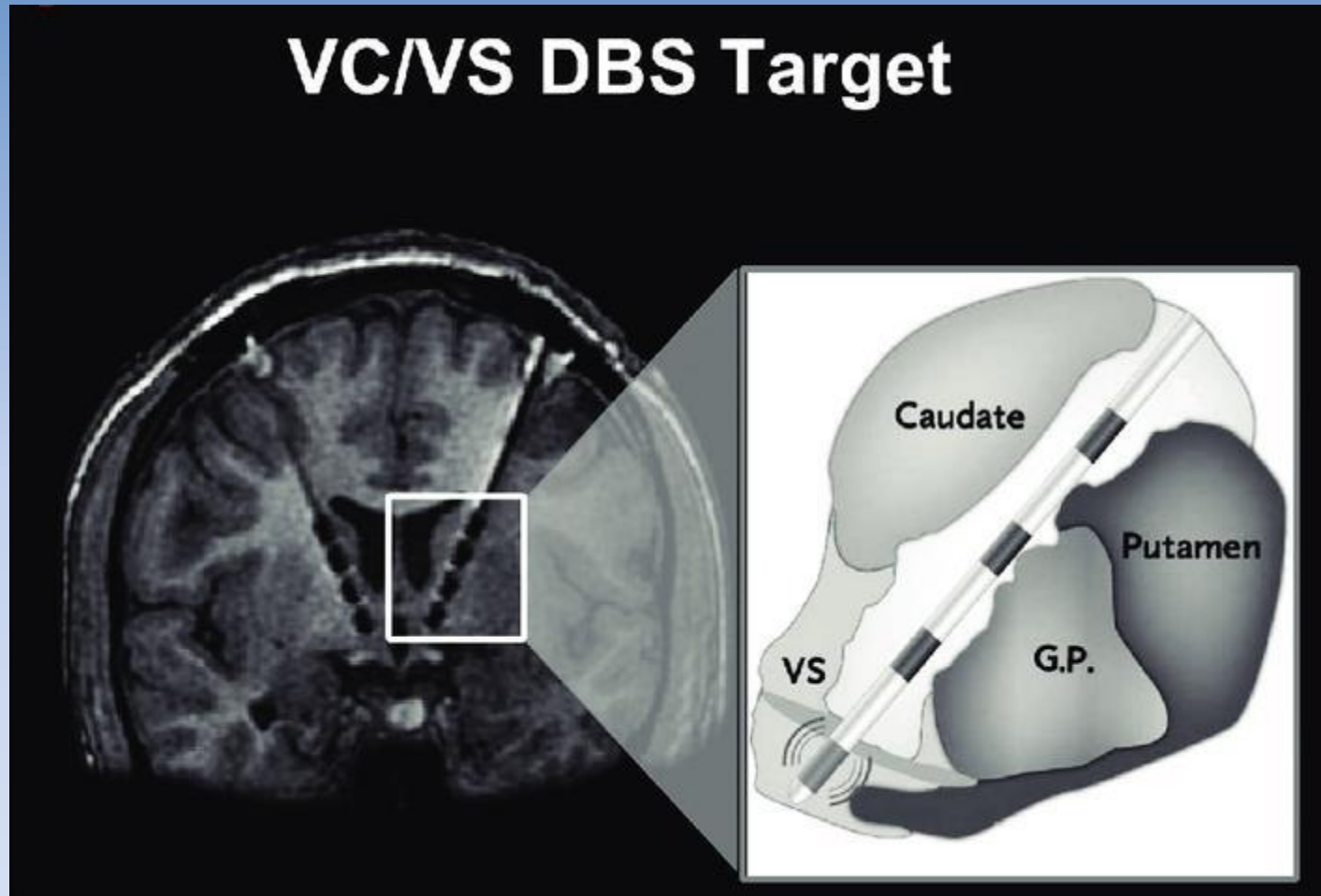




DELL



VC/VS DBS Target



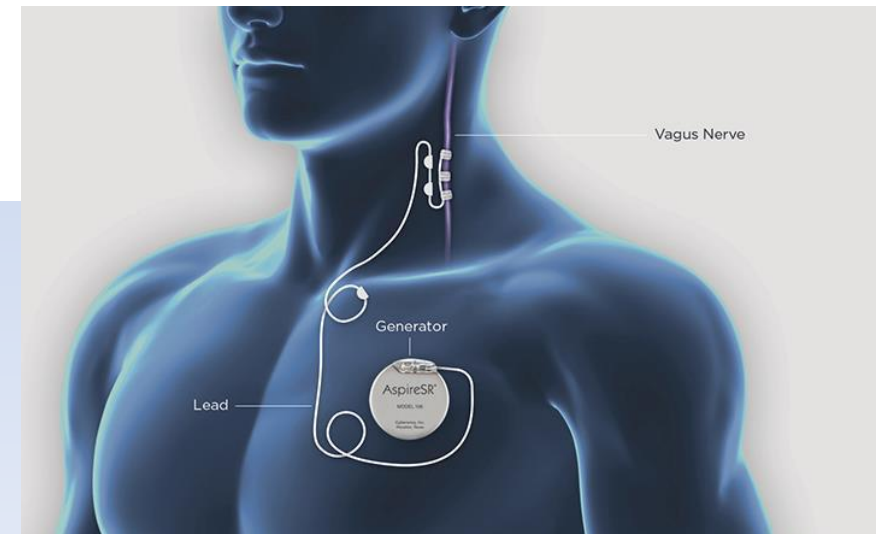
DBS vs. Lesioning

YBOCS	Capsulotomy	DBS	p
Response (>35% improvement)	68%	46%	0.01
Remission (<8)	9%	2%	0.0001
No Response	32%	54%	0.008
Worse (>25% worse)	1%	0%	NS

VNS

Vagus nerve stimulation

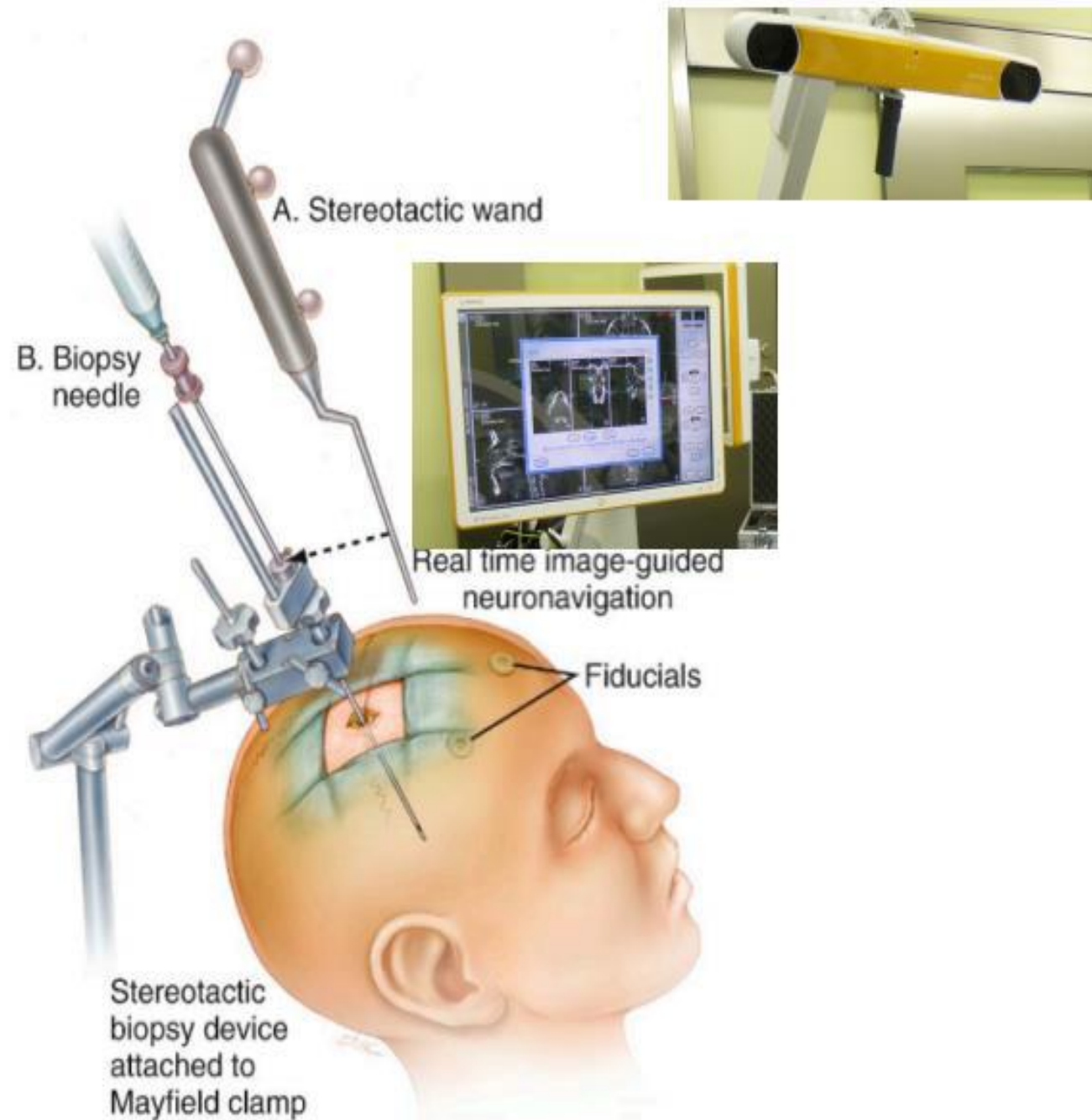
- Clinically available treatment
- Pulse generator
 - battery powered
 - implanted in the chest wall and
 - electrode attached around one vagus nerve (typically the left)
- Established option for medication refractory epilepsy
- **Lack of acute rigorous studies for treatment resistant major depression**

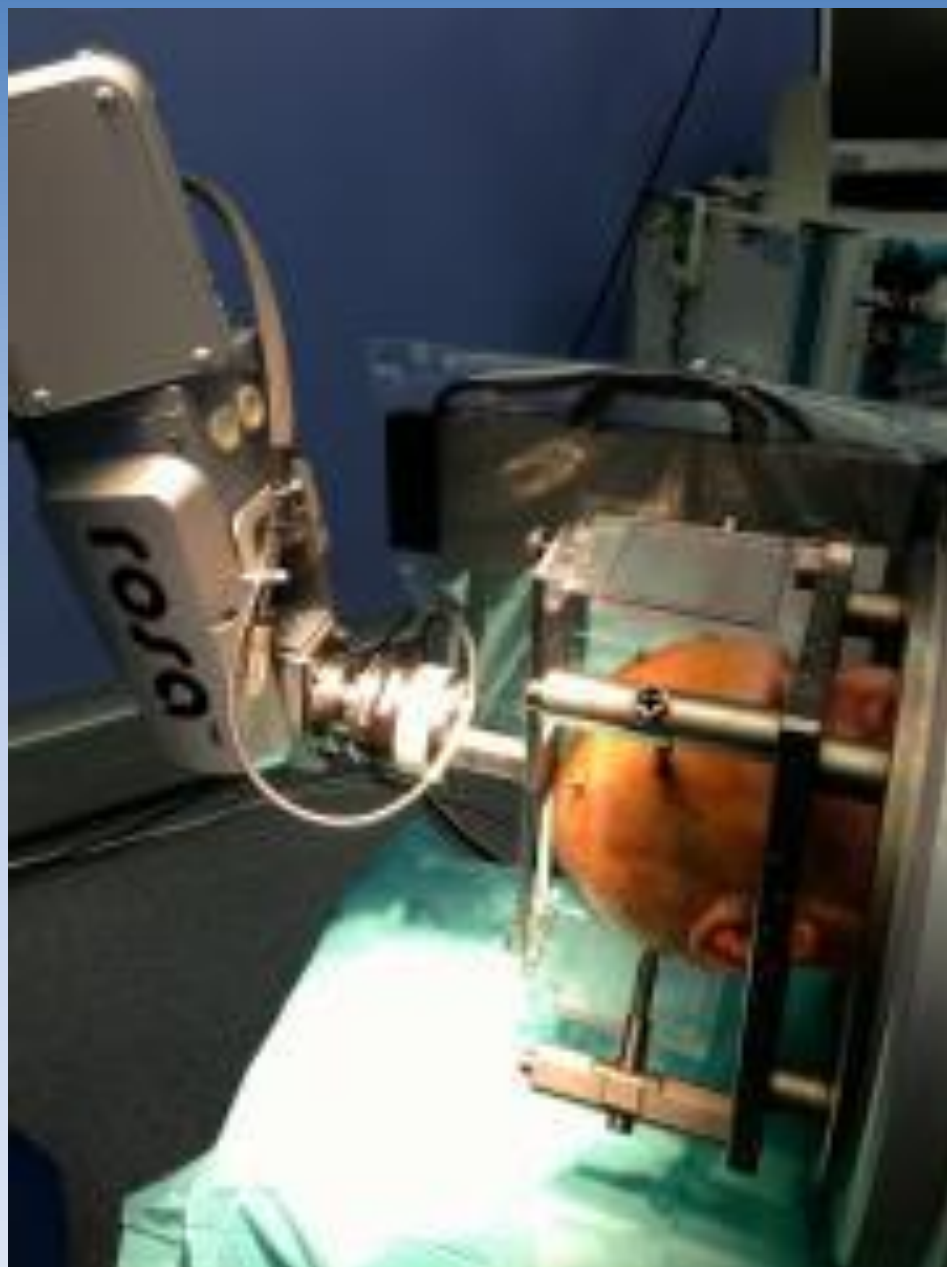


DBS Indications Under Investigation

- Addiction (ventral striatum)
- Obesity (Hypothalamus , Accumbens)
- Anorexia (cingulum, ventral striatum)
- Alzheimer (Meynert nucleus, Mammillothalamic tract , fornix)

FRAMELESS STEREOTACTIC SYSTEMS







Thank you for your attention

Any question?