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Cyberknife

Slicing Knife – A Boon without Pain

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Poster Award
Certificate

Introduction

Cyberknife is a high precision, painless, non-invasive robot guided frameless stereotactic radiosurgery system.

Conclusions

Pioneers:

Dr. John Adler, Prof. of neurosurgery, Dr. Lars Lekshell, creator of Radiosurgery.

Fig. 1: Dr. John Adler

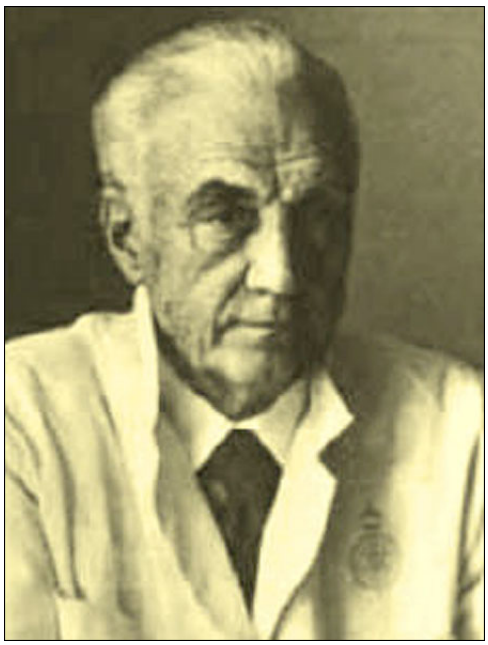

Fig. 2: Dr. Lars Lerkshell

Evolution:

X-ray -> CT imaging -> MRI, IMRT ->PET-CT ->Cyberknife

Fig. 3: Evolution

Principle:

Stereotactic Radiosurgery – combination of stereotaxy & radiosurgery.

Components:

Multijoint robotic arm, Image Guidance system, Linear accelerator (Linac), Synchrony system, Treatment couch.

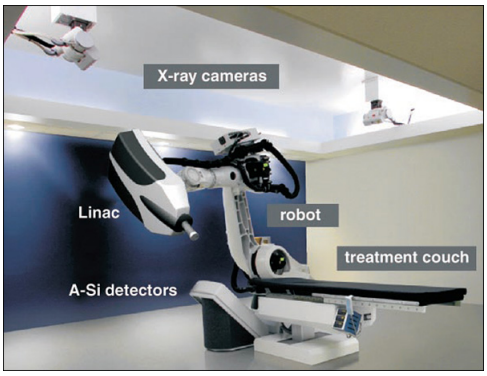

Fig. 4: Components

Procedure:

Patient consultation, Patient preparation, Facemask to hold the head steady during head & neck treatment & Fiducials-metal markers placed near the tumor site to guide the beam for treatment outside the head, Image acquisition using PET CT & Treatment planning, Treatment delivery (30-90min procedure) in single/hypofractioned doses, Follow up: Imaging & consultation to monitor treatment efficacy (6 months).

Fig. 5: Patient Counsultation

Fig. 6: Step 2-patient preparation

Fig. 7: Step 3(a) face mask

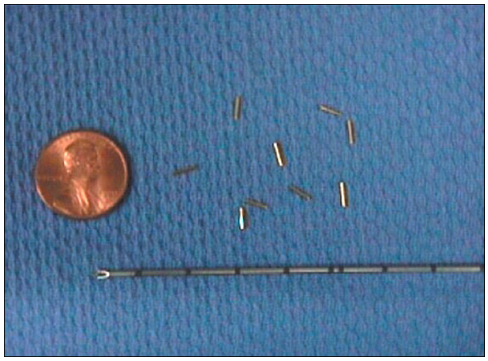

Fig. 8: Step-3(b) fiducials

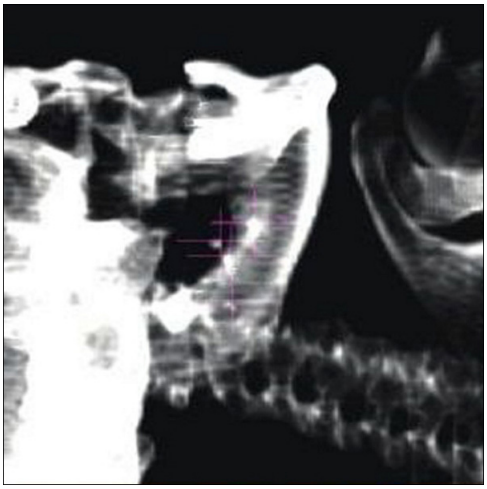

Fig. 9: Step 3(b) pink marks indicating fiducials to guide tumors

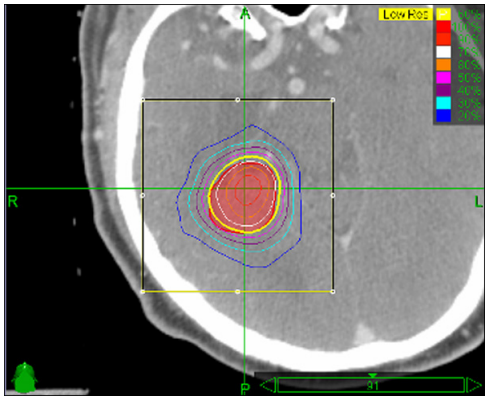

Fig. 10: Step 3(b) pink marks indicating fiducials to guide tumors

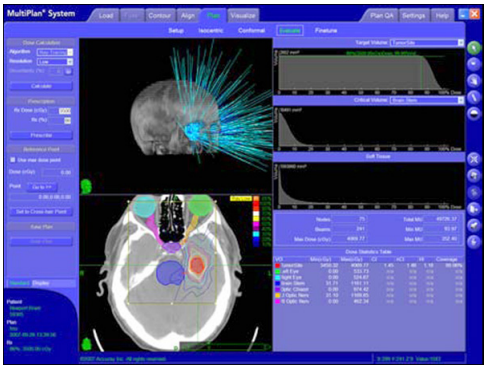

Fig. 11: Step 6 targeting and treatment delivery

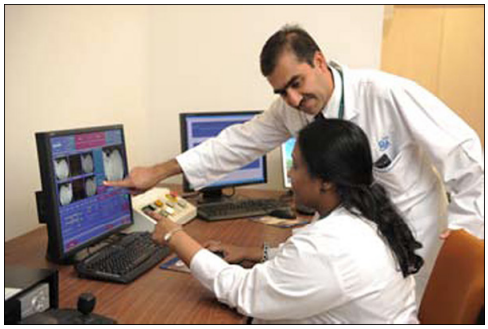

Fig. 12: Step 7-follow up imaging

Treatment team:

Radiation oncologist, Neuroradiologist, Neurosurgeon, Physicist, Dosimetrist, Radiation therapy nurse, Neurologist.

Fig. 13: Treatment team

Applications:

Cervical tumors, Radiosensitive structures, Nasal tumors, Orbital tumors, Multiple tumors, AV malformation, Vascular tumors, Inoperable tumors, Maximum irradiated patients, Trigeminal neuralgia.

Fig. 14: Cervical Tumors

Fig. 15: Radiosensitive structures

Fig. 16: Nasal tumors

Fig. 17: Orbital tumors

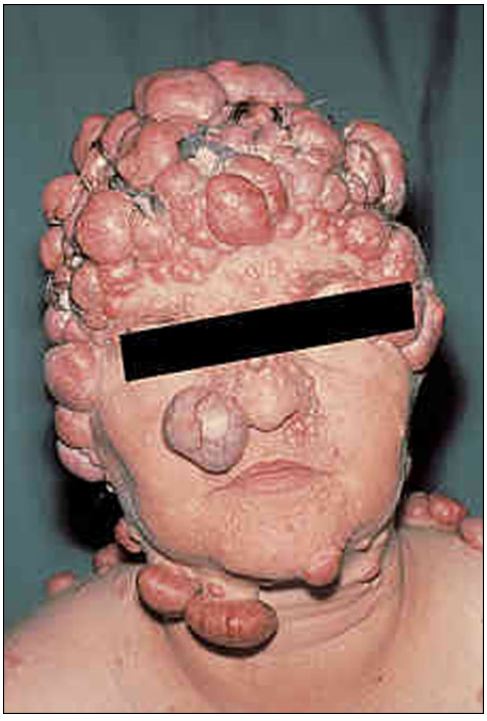

Fig. 18: Multiple Tumors

Fig. 19: AV malformations

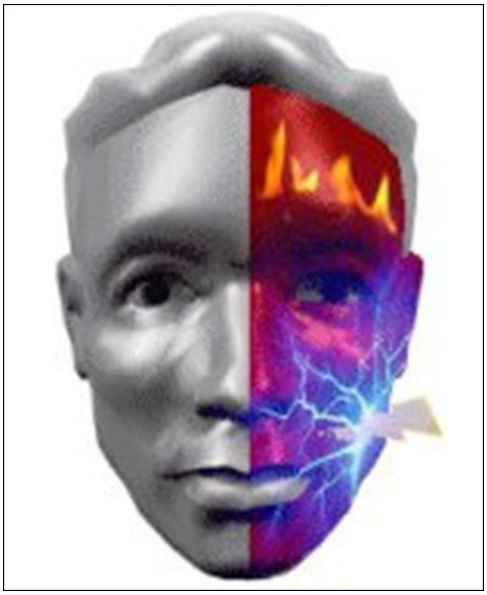

Fig. 20: Trigeminal Neuralgia

Fig. 21: Vascular Tumors

Fig. 22: Maximum Irradiated Patients

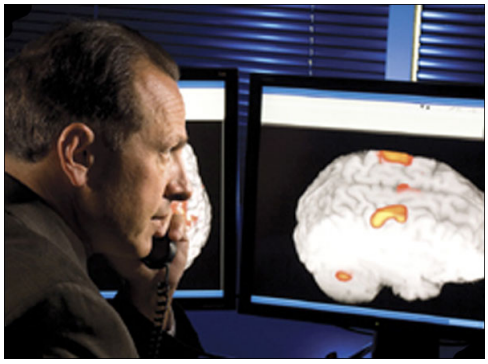

Fig. 23: Inoperable tumors

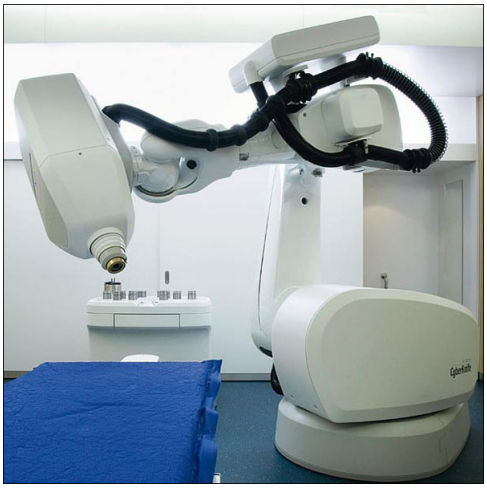

Fig. 24: Applications

Advantages:

Pinpoint accuracy, Noninvasive, Frameless, Reduced risk of infections, Quick recovery, Better quality of life, Continuous tumor tracking, Multiple tumor treatment.

Fig. 25: Advantages and disadvantages

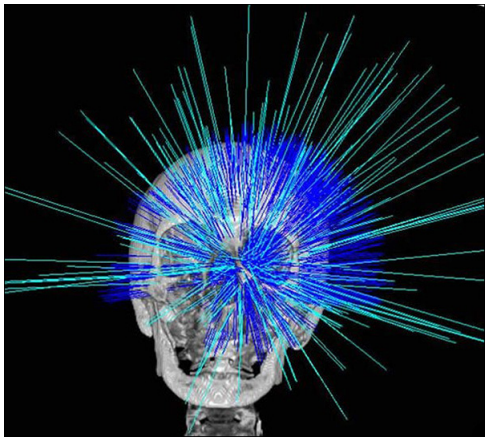

Fig. 26: Pinpoint accuracy

Fig. 27: Non-invasive

Fig. 28: Frameless

Fig. 29: Reduced Risk for Infections

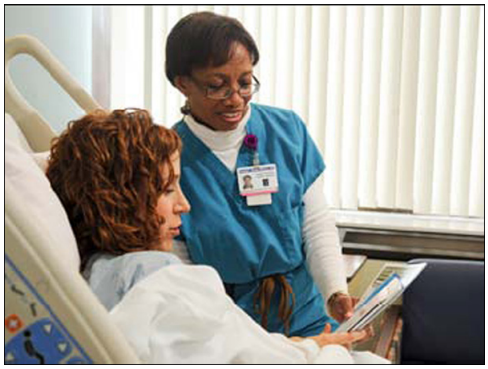

Fig. 30: Quick Recovery

Fig. 31: Better Quality of Life

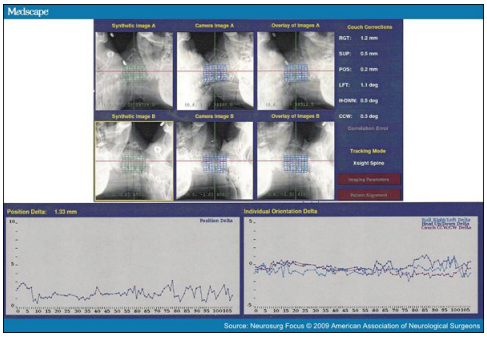

Fig. 32: Continuous Tumor Tracking

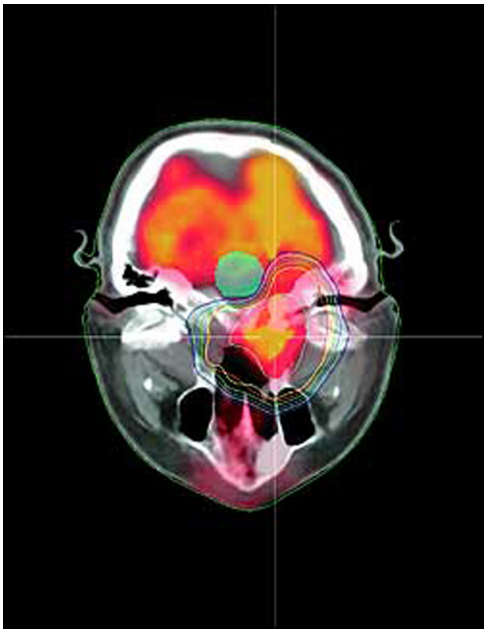

Fig. 33: Multiple Tumors

Disadvantages:

Nausea, vomiting, diarrhoea, fatigue, skin itching. Longer time when multiple tumors are ablated during the same session. Placement of fiducials for treating lesions outside head region.

Fig. 34: Side effects: Nausea, vomitting, diarrhoea, Fatigue,Skin Itching

Fig. 35: Placement of fiducials

Fig. 36: Longer Time

Uniqueness:

Pinpoint accuracy, Ultraflexibility- robot with six joints & delivers over 1200 beams, Continuous tumor tracking, Treatment of sites anywhere in the body, Noninvasive, painless, frameless, Quick recovery & return to normal life.

Fig. 37: Uniqueness

Conclusion:

Cyberknife is the first and only radiosurgery system designed for treatment anywhere in the body & it uses continual X-ray image guidance technology and computer-controlled robotic mobility to automatically track, detect, and correct for patient movements and target without interrupting the treatment. Cyberknife gives a renewed ray of hope for a better quality of life especially for patients with previously diagnosed inoperable or inaccessible tumors and for those who have already received the maximum amount of radiation through other treatment methods and offers quick recovery and return to normal life.

This Poster was submitted by Dr. Cristalle Soman.

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