LECTURE TITLE

History of Radiology

LEARNING OBJECTIVE

To understand the physics behind discovery of x-rays

To know the different steps how modern day radiology evolved.

To know the different physicists' and doctors

contribution towards modern day dental radiology.

CONTENT

Introduction

Evolution of x-rays

Evolution of dental radiology

Evolution of dental x-ray machine and films

Radiation hazards

INTRODUCTION

ROENTGEN's discovery depended upon development and application of three converging thoughts

ELECTRICITY, VACUUM & MAGNETISM

ELECTRICITY

GILBERT gave the term ‘electricity’.

STEPHEN GRAY discovered that current would flow over the conductor for great distances.

ABBE NOLLET ‘electric egg’ became the direct descendent of discharge tube.

CHARLES DUFAY – vitreous & resinous electricity.

VACCUM

OTTO VAN GUERICKE 1648:

first air pump used in formation of vacuum.

Experiment on ‘ Magdeburgh Hemispheres’

EVANGELISTA TORICELLI 1643

Mercury Barometer

FRANCIS HAUKSBEE- electricity producing friction machine within a vacuum

Discovery of x-rays

1785

Sir WILLIAM MORGAN

Obtained a vacuum so that there was no discharge

Glass cracked – display of colors

YELLOW GREEN RED VIOLET BLUE

Unknowingly he was the first to discover x-rays.

1821 Michael faraday

First experiment on electric charges

Fluorescence as radiant matter: 4th state of matter

1870 Wilhelm Hittorf identified CATHODE rays

Philip lenard

Cathode rays pass through aluminium window

Called the rays as lenard's rays

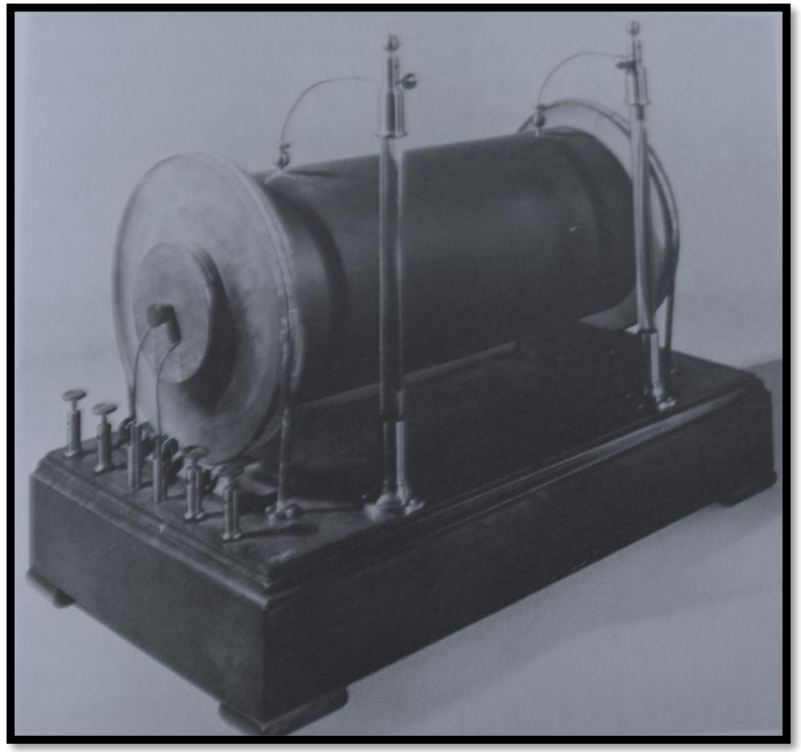
Proposed inverse square law

Wilhelm Conrad Roentgen

(1845-1923)

On 8 November 1895, German Physics Professor Wilhelm Conrad Roentgen

Wurzburg laboratory



Ruhmkorff induction coil

Hittorf- Crookes tubes used by Roentgen to discover x rays

Its traditionally known as "the first X-ray picture" and "the radiograph of Mrs. Roentgen's hand. "

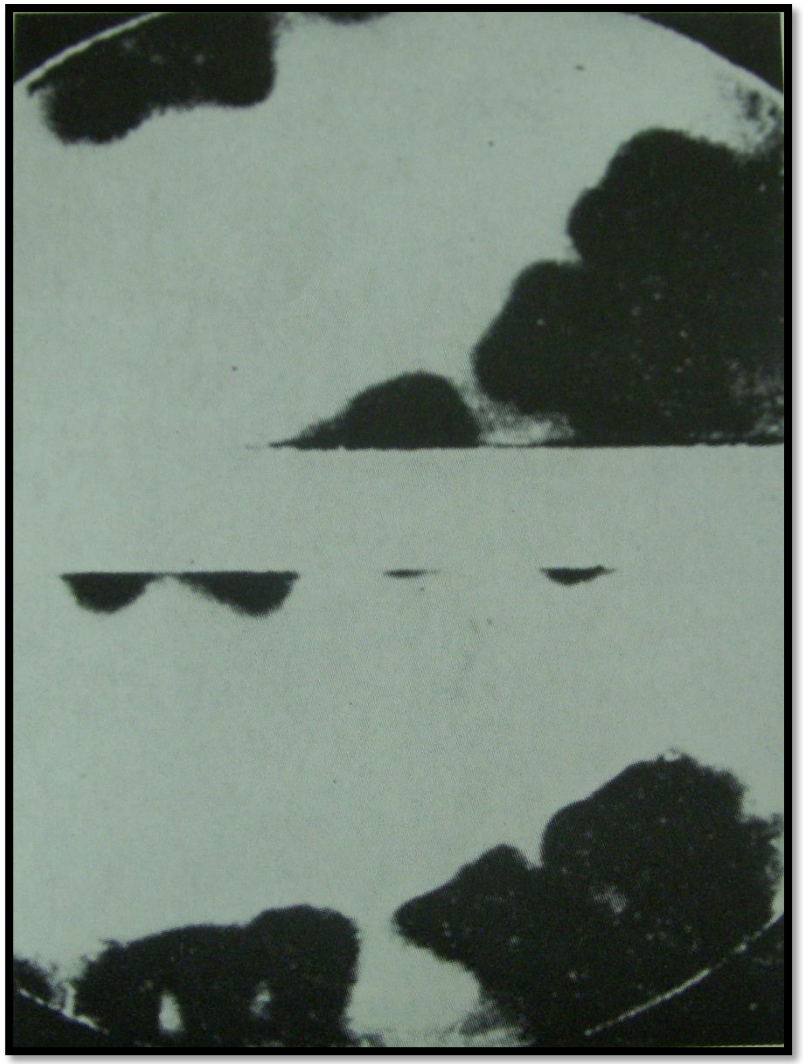
First noble prize and many other prizes for his discovery.

EVOLUTION OF DENTAL RADIOLOGY

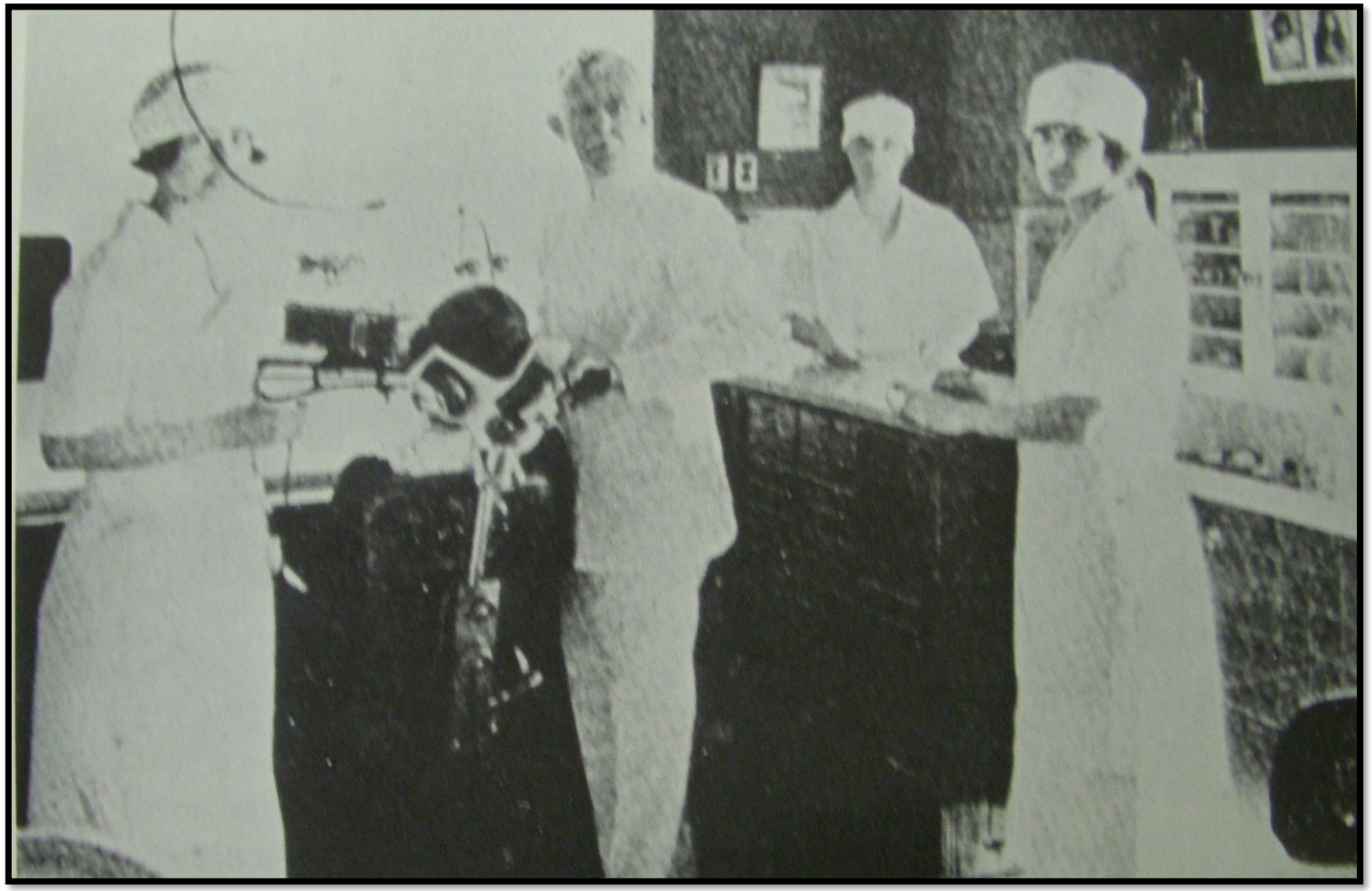
First dental radiograph- ?

Two weeks after the announcement of Roentgen's discovery Dr Otto Walkhoff made first dental radiograph.

Wilhelm Koenig, frank Harrison, c.Edmund kells.



Dr C Edmund Kells



New Orelean dentist and inventor Dr C Edmund Kells completely fitted his office with electricity to dental practice.
His innovation first compressed air system, an electric driven hand piece and first suction apparatus.

Father of dental radiology

Dr C Edmund Kells with help of Prof Brown Ayres took first intraoral radiograph.

First radiograph of root of teeth.

In 1896 Kells designed dental X ray apparatus for holding the tube.

In 1899 Kells mentioned importance of keeping film and object right angle to x ray source.

First to use compressed air in dental office.

First to advocate right angle or paralleling technique.

First dentist to use radiograph in root canal therapy.

In 1904 Dr W A Price described two techniques for film positioning in oral cavity.(parallel angle technique and other based on rule of isometry).

About 1907 Dr Cieszynski also applied the rule of isometry to intraoral radiography.

In 1903 Kells opened the first x ray***(dental and medical***) laboratory.[radiograph (skiagraph) chest , hip, hand with piece of brass, bullet in head, measurement of root canal.]

First stereoscopic radiograph was taken there.

In 1910 Franklin Mc Cormack opened first dental x ray labortory in San Fransisco. Paralleling technique was used with long target film distance.

In 1912 Dr Howard R Raper described a technique used for detection of interproximal caries.(bite wing techniques).

In 1937 Donald Mc Cormack published an excellent article explaining the advantage of paralleling technique over bisecting angle technique.

EVOLUTION OF DENTAL X-RAY MACHINE

X-ray machine

Induction coil :

Primary

Secondary

Interrupter:

mechanical

Vibrating

Mercury

electrolytic

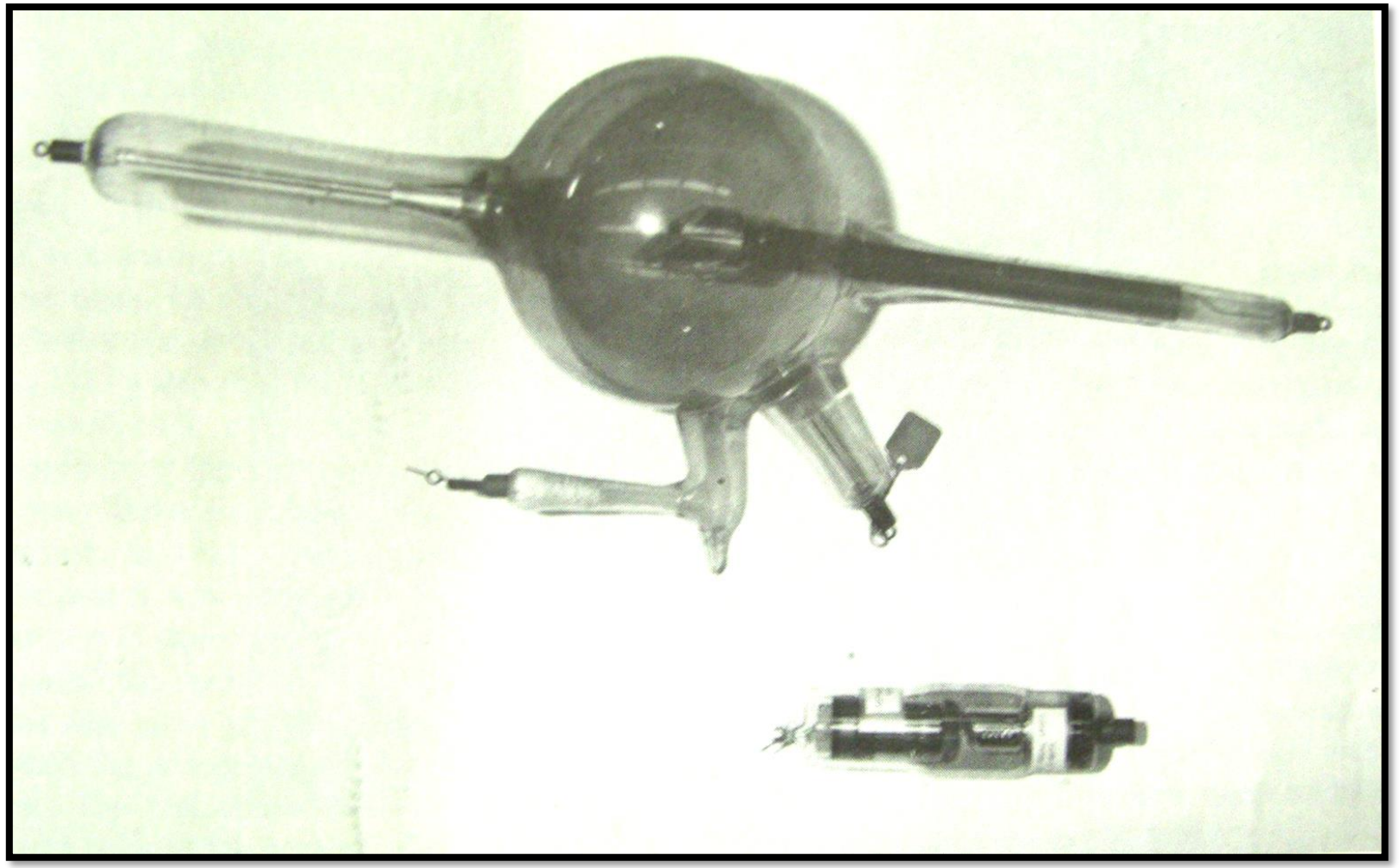
Rheostat

Rumkorff coil

Jumbo coil

Tesla coil

X ray tube



EVOLUTION OF X-RAY FILMS

X ray films

Dr Kells used glass photographic plates or roll films to capture images.

Glass plate were extremely fragile and were uncomfortable for patients.

Cellulose films were inflammable and dangerous to store.

In 1913 first commercial X ray film was given by Kodak company.

Processing of films

First processing involves photographic tank.

Dr Kells was first to change processing tank.

And time temperature process.

In 1896 exposure time was 5-15 min and processing 30-60min.
Today exposure time in most cases is less than 1 sec and processing time as short as 90 sec.

RADIATION HAZARDS

The other side of coin
Radiation hazards

He was also one of the men who made profession aware of the dangers inherent in roentgen's ray.

1896 Frank Harrison- probably the first to report occurrence of radiation hazard

1896 march Dr John Daniel mentioned about hair loss from head

1896 July W. Marcuse published first microscopic study of effect of radiation on tissues.

Elihu Thomson first x-ray worker, adverse effects

1900 keelback irradiation of rats

1901 Willian Rollins irradiation of guinea pigs

Direct relationship between x-rays and biologic effects established.

Positive philosophy of Edmund Kells

"Do I murmur at the rough deal the fates have dealt me? No. I can't do that. When I think of the thousands of suffering patients who are benefited every day by use of x ray, I cannot complain. That a few should suffer for the benefits of millions, is law of nature."

IRONY

At age 40 , Kells first began his work with x-rays

Unaware of adverse effects of cumulative doses

Held films in place with his fingers

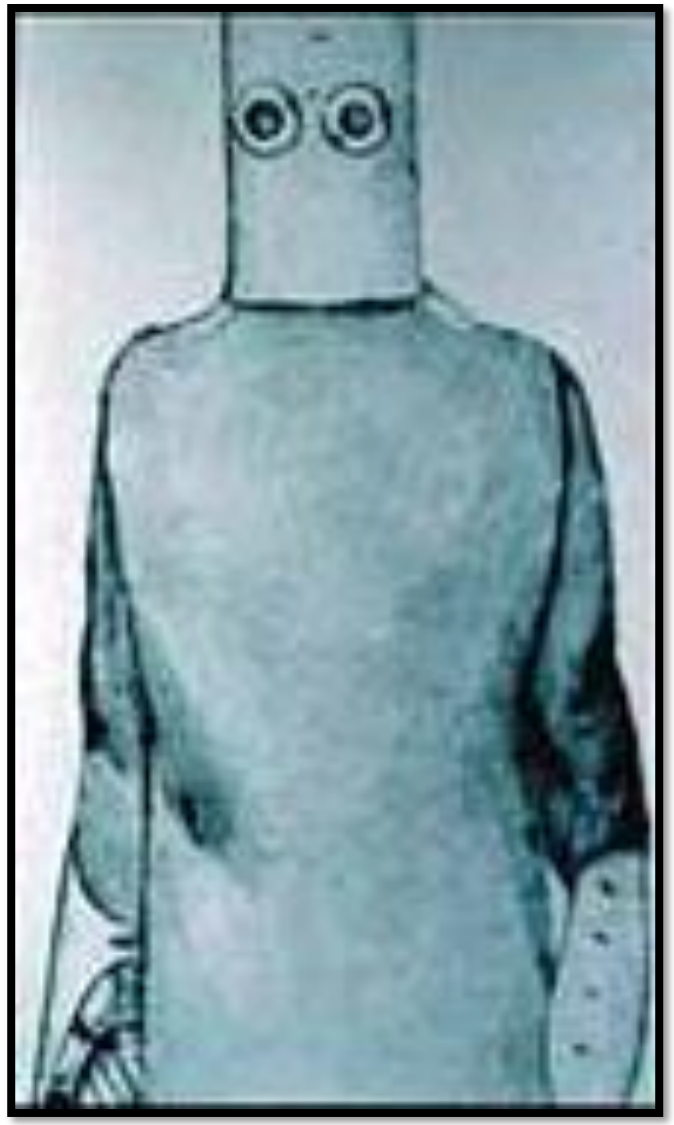
By age 50 cancer in his right hand

Over the next 20 yrs, 42 operations , eventually lost his hand arm and shoulder.

On may 7th, 1928, at age 72, he commited suicide- due to great suffering.

Dr William Rollins was first to recognize biologic hazards

Guidelines for the protection of patient and operator of x ray equipment.



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Textbook of dental radiology 3rd edition – pramod john R.

Essentials of dental radiography and radiology – eric whites.

Conclusion

Dental radiology is one of the most important branch of dentistry as without radiographs one can be handicapped in all forms of dental treatment.

Knowledge of the history and evolution is needed to further understand the current trends.

Take home message

NOTHING MATERIALIZES AS IF BY MAGIC OVERNIGHT

Knowing the history is very important step towards the hardships done to achieve what we have today.

PROBABLE SAQS AND LAQS

SAQs

1. Short note on father of dental radiology
2. Write a short note on discovery of xrays
3. Short note on dr Edmund kells.

PROBABLE SAQS AND LAQS

LAQs

Describe in details the discovery of xrays. Add a note on the evolution of xray machine and films