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Radiology, Diagnostic Imaging and Instrumentation

Highlights

- Computed Tomography Scan
- Study of Retro Cochlear Pathology
- Evaluation of Radiation Hazard
- Extensive Review of Medical Image

Discovering Thoughts, Inventing Future

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The Radiation Dose Measurement of the Computed Tomography Scan to Ensure the Safety for Medical Staff in Dr. Sardjito General Hospital, Yogyakarta, Indonesia

By Hasan Mohammad Hasan Sbaihat, Arif Faisal & Kusminarto

Gadjah Mada University

Abstract- Background: The Computed Tomography(CT) scan has been recognized as a high radiation dose modality when compared to other diagnostic X-ray techniques, since its launch into clinical practice more than 30 years ago, moreover more than 60 million CT examinations were performed in the United States in 2006, as well as in 2015 the number of CT examinations in Dr. Sardjito General Hospital, Yogyakarta, Indonesia is 5963 scans, the cancer risk associated with radiation exposure due to medical diagnostic imaging has been receiving significant attention in recent years, as well as several studies estimating the risk of cancer induction is provided by situations in which high radiation exposures have occurred.

Objectives: This study is to measure the dose rate that reach to medical staff workplace at Dr. Sardjito General Hospital, Yogyakarta, Indonesia from CT scans exposure and compare it with International Commission on Radiological Protection (ICRP) recommendations to ensure that the workplace is safe for medical staff, as well To measure the dose rate in CT department from CT scans exposure in different points, and compare it with other points to define the safest area for patient companion from CT radiation dose inside CT room.

Keywords: *computed tomography, dose rate, international commission on radiological protection.*

GJMR-D Classification: *NLMC Code: WN 206*

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Methods: Measurement the radiation dose by taking three different reading from different CT scans; brain, chest and abdomenat different points in CT scan department. Subject in this study is 36 points scattered around CT machine in CT department were it divided into 3 groups: group (I); which represent the radiation dose rate in workplace area and it include ten points (thirty different CT scans), group (II) which Represent the dose rate inside CT room and it include fifteen points (forty five different CT scans), group (III); which represent the radiation dose rate outside the CT room and it include eleven points (thirty three different CT scans), therefore the radiation dose were measured in three groups through one hundred and eight CT scans. A cross- sectional design to determine the radiation dose that maybe exposed to the medical staff who is working in CT department by measured the radiation dose rate. Statistical analysis was performed by using one way ANOVA test and posthoc test of LSD, HSD. RAM ION meter was used to detect the radiation dose rate.

Results: Group (I) with the mean dose is (0.0035mSv/h) and standard deviation (0.00485), group (II)with mean (10.7451 mSv/h) and standard deviation (12.87781) and group (III) with mean (0.008 mSv/h) and standard deviation (0.00185). ($P < 0.05$), thus conclude that there are a difference between the points (the dose rate (mSv/h) value in thirty six dose rate points around the CT machine as well ($p < 0.05$), therefore there are a difference between the three groups(the mean of dose rate (mSv/h) between the three groups in CT scan department.

Conclusion: Theradiation dose rate from CT scan examinations that reach to medical staff workplace Group (I) at Dr. Sardjito General Hospital, Yogyakarta, Indonesia is safe according to the ICRP recommendations, the research has revealed that the less radiation rate dose inside CT room Group (II) is point number three which equal (0.127 mSv/h), as well as point number twenty seven which equal (1.05 mSv/h).

Keywords: computed tomography, dose rate, international commission on radiological protection.

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I. Introduction

Computed tomography (CT) system consists of an X-ray source, a rotary table, which creates cross section images by projecting a beam of emitted photons through one plane of an object from defined angle positions performing one revolution. (1) The radiation dose in X-ray CT has become a topic of high interest due to the increasing number of CT examinations performed worldwide. (2)

When Godfrey Hounsfield developed the first clinical CT scanner in 1969, a new time of cross-sectional imaging of the human body was initiated. The use of CT examinations has increased rapidly since then. Recent surveys in large medical centers have found that CT studies now often account for 25% of all examinations and 60 to 70% of the patient dose received from diagnostic radiology. In addition, patient surveys reveal a wide range of patient doses for the same examination. Also, there is now widespread concern about the increase in CT doses. Several different factors contribute to the trend of increasing use of CT scanning and is being documented by international organizations.(3,4)

Lead the world in number of CT scanners per head in Japan, United States and Australia with 64, 26 and 18 scanners per million citizens respectively. Although typical CT radiation doses have not significantly changed over the years, usage of CT as a diagnostic tool has dramatically increased.(5)

The CT scanning has been recognized as a high radiation dose modality, when compared to other diagnostic X-ray techniques, since its launch into clinical practice more than 30 years ago.(6)

The regulatory bodies lay down norms for protection against radiation and also recommend the dose limits for radiation workers and the general public. The ICRP or the International Commission for Radiation Protection is the international regulatory body. Each country has its national counterpart of the ICRP.(7,8)

The importance of radiation dose from x-ray CT has been underscored recently by the attention given in the scientific literature to issues of dose and the associated risk. The dose levels imparted in CT exceed those from conventional radiography and fluoroscopy and the use of CT continues to grow, often by 10% to 15% per year. According to 2006 data, approximately 62 million CT examinations were performed in hospitals and outpatient imaging facilities in the United States (American Association of Physicists in Medicine.(9)

II. Material and Methods

This study is a cross- sectional design to determine the radiation dose that maybe exposed to the medical staff who is working in CT department by measurement the radiation dose by taking three different reading from different CT scans; brain, chest and abdomen at different points in CT scan department. Subject in this study is 36 points (Figure 1)which scattered around CT machine in CT department were it divided into 3 groups: group (I); which represent the radiation dose rate in workplace area and it include ten points (thirty different CT scans), group (II) which Represent the dose rate inside CT room and it include fifteen points (forty five different CT scans), group (III); which represent the radiation dose rate outside the CT room and it include eleven points (thirty three different CT scans), therefore the radiation dose were measured in three groups through one hundred and eight CT scans. A cross- sectional design to determine the radiation dose that maybe exposed to the medical staff who is working in CT department by measured the radiation dose rate. Statistical analysis was performed by using one way ANOVA test and post hoc test of LSD, HSD. RAM ION meter was used to detect the radiation dose rate.

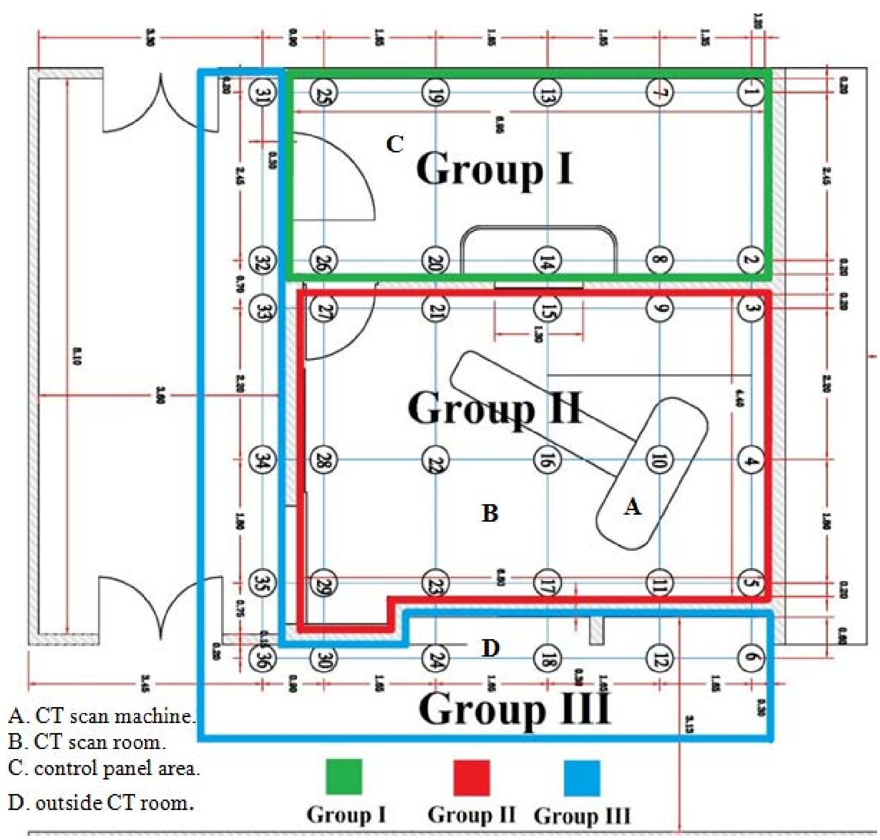

Figure 1: The three groups and the points position in each group.

III. Result

The data of this research was obtained from Dr. Sardjito General Hospital of Yogyakarta, Indonesia. A radiation dose rate (DR) of 36 points were measured in the CT scan Department through one hundred and eight CT scans for different examinations (brain, chest, and abdomen); the different points scattered around the CT Machine in different position.

The different of dose rate (mSv/h) value was obtained according to the CT scan type as well as the distance between CT machine and the interest area where the points were measured as shown in (Table 1). The data was collected at the same level of iso-center of CT Machine which equals 103 centimeter from the floor level, therefore all the points (108) in three groups of this research was measured at the same level, after applying one way ANOVA test ($P < 0.05$), thus conclude that there are a difference between the points (the dose rate (mSv/h) value in thirty six dose rate points around the CT machine.

And also to detect if there are a different between the three groups where the dose rate was measured (Table 2), it is done by applying one way ANOVA test ($p < 0.05$),thus conclude that there are a difference between the three groups (the mean of dose rate (mSv/h) between three groups in CT scan department).

Table 1: The descriptive statistic of different dose rate (mSv/h) value, mean of dose rate, standard deviation, standard error of mean in each point around the CT machine

Point	n	Mean of dose rate	Standard deviation	Standard error of mean
1	3	0.0000	0.00000	0.00000
2	3	0.0043	0.00404	0.00233
3	3	0.1277	0.09579	0.05531
4	3	37.7333	1.16762	0.67412
5	3	16.5000	3.06431	1.76918
6	3	0.0003	0.00058	0.00033
7	3	0.0020	0.00000	0.00000
8	3	0.0050	0.00265	0.00153
9	3	14.8333	2.11975	1.22384
10	3	42.8333	1.06927	0.61734
11	3	8.7333	3.20208	1.84872
12	3	0.0000	0.00000	0.00000
13	3	0.0020	0.00000	0.00000
14	3	0.0070	0.00265	0.00153
15	3	6.8667	2.56580	1.48137
16	3	12.6333	6.22923	3.59645
17	3	2.6000	1.45258	0.83865
18	3	0.0000	0.00000	0.00000
19	3	0.0043	0.00058	0.00033
20	3	0.0047	0.00208	0.00120
21	3	1.0660	0.30638	0.17689
22	3	4.3667	2.21209	1.27715
23	3	4.8000	0.26458	0.15275
24	3	0.0000	0.00000	0.00000
25	3	0.0023	0.00058	0.00033
26	3	0.0040	0.00265	0.00153
27	3	1.0500	0.62650	0.36171

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28	3	3.1667	1.25033	0.72188
29	3	3.8667	0.47258	0.27285
30	3	0.0000	0.00000	0.00000
31	3	0.0033	0.00577	0.00333
32	3	0.0007	0.00115	0.00067
33	3	0.0010	0.00100	0.00058
34	3	0.0010	0.00100	0.00058
35	3	0.0020	0.00100	0.00058
36	3	0.0000	0.00000	0.00000
Total	108	4.4787	9.82373	0.94529

Results of one-way ANOVA:

Groups: df = 35, 72; F= 128.44.P = 0.00

ANOVA, analysis of variance; df, degree of freedom;

F, F value; n, number of points were the dose rate measured.

Table 2: The group's descriptive statistic of different dose rate (mSv/h) value, mean of dose rate, standard deviation, standard error of mean in each group around the CT machine

Group	n	Mean	Standard deviation	Standard error of mean
1.00	30	0.0049	0.00485	0.00089
2.00	45	10.7451	12.87781	1.91971
3.00	33	0.0008	0.00185	0.00032
Total	108	4.4787	9.82373	0.94529

Results of one-way ANOVA:

Groups: df = 2, 105; F= 21.79.P = 0.00

ANOVA, analysis of variance; df, degree of freedom;

F, F value; n, number of groups were the dose rate measured.

a) The Three Groups in CT Scans Department

This study divided the CT scan department to the three groups (group I; workplace area, group II; inside CT room area , group III; outside area) each one hasa number of points(Figure 1) where the dose rate was obtained, the result of dose rate will describe to show the dose rate in each point of all groups.

Group (I): this group represent the radiation dose rate in workplace area, which include ten points (thirty different CT scans) with the mean dose is (0.0049 mSv/h) and standard deviation (0.00485) as shown in (Figure 2).

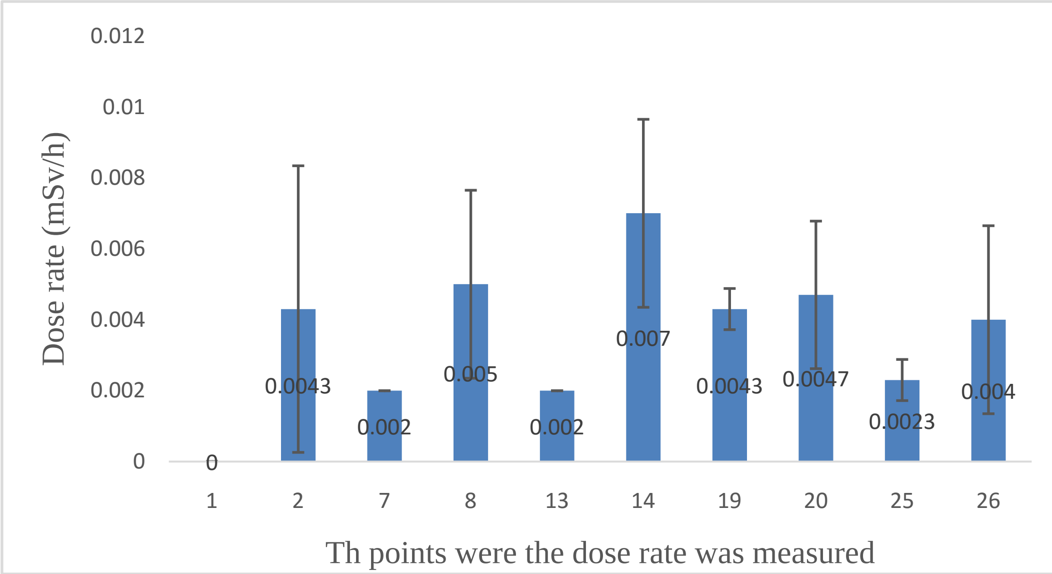

Figure 2: The dose rate (mSv/h) at each point in group (I).

Group (II): This group represents the dose rate inside CT room, which includes fifteen points (forty five different CT scans) with mean (10.7451 mSv/h) and standard deviation (12.87781) as shown in (Figure 3).

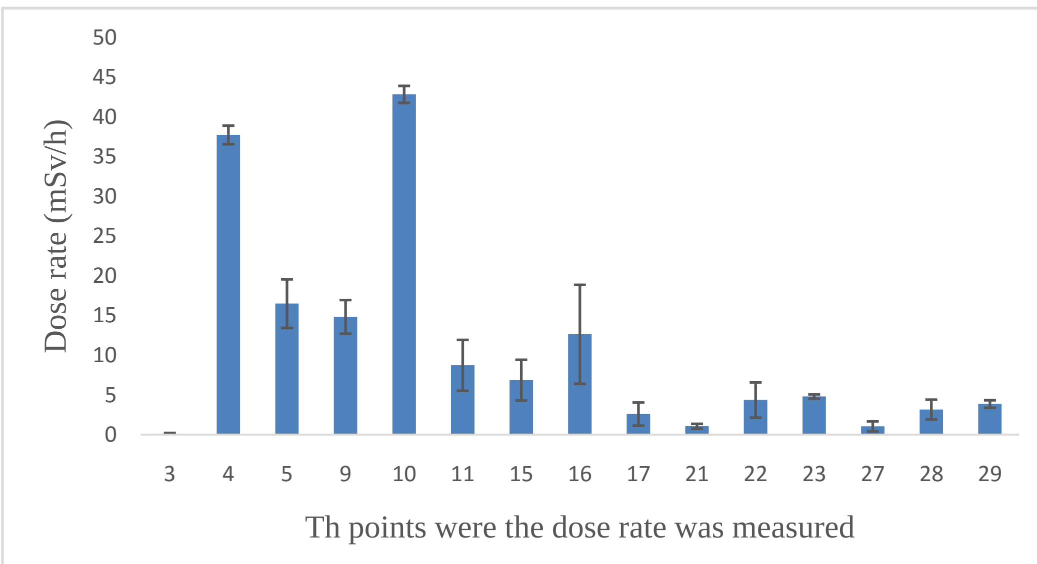

Figure 3: The dose rate (mSv/h) at each point in group (II).

Group (III): This group represent the radiation dose rate outside the CT room, which include eleven points (thirty three thirty different CT scans) with mean (0.008 mSv/h) and standard deviation (0.00185) as shown in (Figure 4).

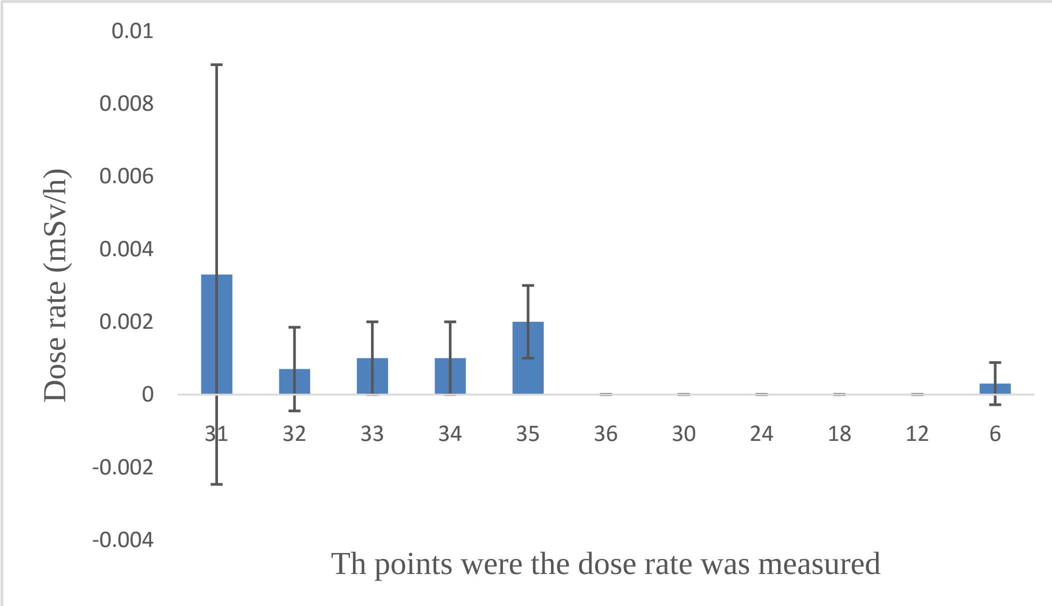

Figure 4: The dose rate (mSv/h) at each point in group (III).

IV. Discussion

In this study, the measurement of dose rate that reach to medical staff workplace at Dr. Sardjito General Hospital, Yogyakarta, Indonesia from CT scans exposure in different points was done, and compare the average of dose rate in each point with ICRP recommendations to ensure that the workplace is safe for medical staff, as well to measure the dose rate that reach to medical staff workplace at Dr. Sardjito General Hospital, Yogyakarta, Indonesia from CT scans exposure in different points, and compare the average of dose rate in each point with the average of dose rate in other points (inside, outside) CT room to define the safest area from CT radiation dose.

During the CT scan operation there are an X ray production and the x-ray beam passes through the human body, three possible fates await each photon; it can penetrate, it can interact with the human body and be completely absorbed, it can interact and be scattered (secondary radiation) or deflected from its original direction and deposit part of its energy, after all this study was measured the dose rate of scatter radiation during CT examination, in this study there are three groups it will be discussed.

Group (I): This group represented the core of this study because the result from this group can answer the research question that; does the quantity of radiation from CT examinations that reach to medical staff workplace at Dr. Sardjito General Hospital, Yogyakarta, Indonesia is less than ICRP recommendations?, as well the result from this group can prove the research hypothesis. The Commission recommends a limit on effective dose of 20 mSv per year averaged over 5 years (100 mSv in 5 years), with the further provision that the effective dose should not exceed 50 mSv in any single year. The 5-year averaging period is intended to provide more flexibility than would be the case with a strict annual limit, while still meeting the Commission's objective that the total effective dose received in a full working life should not exceed about 1 Sv received moderately uniformly year by year.[(10)] In CT scan department the medical staff work eight hours per day, five days per week, forty week per one year so the total work hours of medical staff in Dr. Sardjito General Hospital, CT scan department is two thousand hours. Therefore 20 mSv/h divided by (2000 h) the result will be (0.01mSv/h) or in another way its equal (10μSv/h). The group (I) has a ten different dose rate values points fluctuated from (0 μSv/h) in point number one the safest area in medical staff workplace to the 0.007mSv/h (4μSv/h) in point number fourteen, the most commonly used place from medical staff in points eight, fourteen, and twenty, the mean of this three points is 0.0053 mSv/h (5.3 μSv/h) which mean less than ICRP recommended level and its safe for medical staff that work in this three points, anyway the mean of dose rate in group I area is 0.0049 mSv/h (3.6 μSv/h) which mean the dose rate value in group I medical staff workplace is less than ICRP recommended level (3.6 μSv/h < 10 μSv/h), thereforethe group (I) medical staff workplace in CT department is safe.

Group (II): The measurement of radiation dose rate in this group to compare the average of radiation dose rate in each point with the averageof dose rate in other points inside CT room to define the safest area from CT radiation dose, this objective is very important to the patient companion to find less harmful area inside CT room by receiving as low as of radiation dose from CT machine during CT scan, The group (II) have a fifteen different dose rate values points that fluctuated from (0.1277 mSv/h) in point number three the lowest dose rate point to the (42.83 mSv/h) in point number ten the highest harmful point area because it situated closest to the CT machine gantry iso-center, there are a different of dose rate around CT machine.

Group (III): this group represented the radiation dose rate outside the CT room, which include different dose rate values points that fluctuated from (0 mSv/h) in points number thirty six, thirty, twenty four, eighteen, and twelve the lowest dose rate point to the (0.0033 mSv/h) in point number six the highest point area because it situated more close to the gantry if it is compared with another points in group (III).

V. Conclusion and Recommendations

Radiation dose rate from CT scan examinations that reach to medical staff workplace Group (I) at Dr. Sardjito General Hospital, Yogyakarta, Indonesia is safe according to the ICRP recommendations.

Research has revealed that the less radiation rate dose inside CT room Group (II) is point number three which equal (0.127 mSv/h), as well as point number twenty seven which equal (1.05 mSv/h). This two points are very important to the patient accompanist to find less harmful area inside CT room by receiving as low as of radiation dose from CT machine during CT scan.

The radiation dose rate outside the CT room is very low with radiation dose rate mean (0.008 mSv/h).

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The Author wants to praise ALLAH, as well the author would like to extend his sincere appreciation to his supervisors Prof. Dr. Arif Faisal and Prof. Dr. Kusminar to for their invaluable guidance fruitful discussion and comment through this work. Also very special thank for the director of IKD Prof. Dr. Mustofa for his support and assistance. Many thanks to the Radiology Staff in Dr. Sardjito General Hospital, Yogyakarta, Indonesia.

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References Références Referencias

1. Bartscher M, Hilpert U, Goebbels J, Weidemann G. Enhancement and proof of accuracy of industrial computed tomography (CT) measurements. Annals of CIRP. 2007; 56 (1) 495–8.
2. Kalender WA. Dose in x-ray computed tomography. Physics in Medicine and Biology. 2014; 59, 129–50.
3. International Atomic Energy Agency [IAEA]. Dose reduction in ct while maintaining diagnostic confidence. 2009: a feasibility/demonstration study. Retrieved from http://www-pub.iaea.org/MTCD/publications/PDF/te_1621_web.pdf
4. David A, Otha W. Measurements Report Shows Substantial Medical Exposure Increase. National Council on Radiation Protection and Measurements. 2009; 253, 2.
5. Almohiy H. Paediatric computed tomography radiation dose. World Journal of Radiology. 2014; 6(1): 1–6.
6. Lewis M. Radiation Dose Issues in Multi-slice CT scanning. Medicines and healthcare products regulatory agency. 2005; (3): 1–14.
7. Lewis M. Dose issues on multi-slice CT scanners. ImPACT Technol. 2005; (3): 1–14.
8. Grover S, Kumar J, Gupta A, Khanna L. Protection against radiation hazards: Regulatory bodies, safety norms, does limits and protection devices. Indian Journal of Radiology and Imaging. 2002; 2. 12. 157-67.
9. International Commission on Radiological Protection. The 2007 Recommendations of the International Commission on Radiological Protection. Annals of the ICRP. 2007; 37(2-4): 1-332.
10. American Association of Physicists in Medicine [AAPM]. The Measurement, Reporting, and Management of Radiation Dose in CT. Report of AAPM Task Group 23: CT Dosimetry. 2008.
11. International Commission on Radiological Protection. Conversion coefficients for use in radiological protection against external radiation. Annals of the ICRP. 1996; 26(3-4): 1-205.

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Study of Retro Cochlear Pathology for finding Hearing Ability using Tone Decay Test

By Dr. Sharmila. R. Chaudhari
P D E A's Baburaoji Gholap College

Abstract- Pure tone Audiometry (PTA)-Tone Decay Test is the key hearing test used to identify hearing threshold levels of an individual, enabling determination of the degree, type and configuration of a hearing loss. The test is used to indentify quickly screening for Retro Cochlear pathology. In audio logical investigations, the hearing sensitivity is tested for pure tones. The test tones of different frequencies and levels are generated and presented to the patient and hearing thresholds are determined on the basis of patient's response. Thus in this work we described the auditory system and its disorders.

Keywords: *audiometer, pure tone decay.*

GJMR-D Classification: *NLMC Code: WV 201*

STUDYOFRETROCOCHLEARPATHOLOGYFORFINDINGHEARINGABILITYUSINGTONEDECAYTEST

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Keywords: *audiometer, pure tone decay.*

I. Introduction

This work is able to 'Measure of hearing ability of persons using pure Tone Decay Test. Hearing ability differs from person to person. The human ear is most sensitive. Hearing problems increases with age as well as sound pollution. It results in temporary hearing loss. This can be reversed with proper medication or treatment. It occurs when there is difficulty with at least one part of the ear, resulting in an individual hearing some sounds or none at all. This study shows group people like senior citizens of our nearby area, Around 20 persons attended hearing ability test. Result shows that the peoples of this age group have different ear sensitivity. For this test **ELKON EDA 3N3 AUDIO-METER** is used to perform Tone Decay Test & results are concluded.

II. Methodology

Pure tone audiometry is a procedure for determination of the extent of hearing loss and the cause, i.e. conduction or sensorineural loss. The subjects hearing threshold for acoustic stimuli of different frequencies are measured. The initial level of the stimuli is selected by the audiologist.

a) *Tone Decay Test*

Of all the auditory tests designed for detection of the site of pathology in the sensorineural pathway, the tone decay test is the most commonly used, because the test can be reliably carried out on any pure tone audiometer. It has been statistically shown that pathology in the auditory nerve causes an abnormally rapid deterioration in the threshold of hearing of a tone if presented continuously to the ear. In this test, we try to quantify the deterioration in the auditory nerve. This test can be carried out with or without detecting the hearing threshold of the subject.

b) *Overall Result for Tone Decay Test*

- Negative-If patient responed for full 60 seconds
- Positive-If patient has failed to respond for the full 60 seconds.

Object	Age	Treshold		Intensity for Tone Decay		Loudness Level	Remarks
		Left	Right	Left	Right		
1	74	75	70	95	90	Sound heard for all Frequencies	NEGATIVE
2	70	60	55	80	75	Sound heard for all Frequencies	NEGATIVE
3	64	70	65	90	85	AT 95 dB to ne Decay Present	POSITIVE TONE DECAY
4	66	45	55	65	75	Sound heard for all Frequencies	NEGATIVE
5	72	80	55	110	75	AT 95 dB to ne Decay Present	POSITIVE TONE DECAY
6	84	75	65	95	85	AT 2 KH_Z, 90 dB Tone decay Present	POSITIVE TONE DECAY
7	88	60	45	80	65	Sound heard for all Frequencies	NEGATIVE
8	67	55	55	75	75	AT 2KH_Z, 80 dB Tone decay Present	POSITIVE TONE DECAY
9	71	35	30	55	50	Sound heard for all Frequencies	NEGATIVE
10	62	50	60	70	80	Sound heard for all Frequencies	NEGATIVE
11	65	50	50	70	70	Sound heard for all Frequencies	NEGATIVE
12	68	40	35	60	55	Sound heard for all Frequencies	NEGATIVE
13	78	55	50	75	70	Sound heard for all Frequencies	NEGATIVE
14	66	35	40	55	60	Sound heard for all Frequencies	NEGATIVE
15	66	70	60	90	80	Sound heard for all Frequencies	NEGATIVE
16	74	65	60	85	80	Sound heard for all Frequencies	NEGATIVE
17	66	70	70	90	90	AT 2KH_Z, 60 dB Tone decay Present	POSITIVE TONE DECAY

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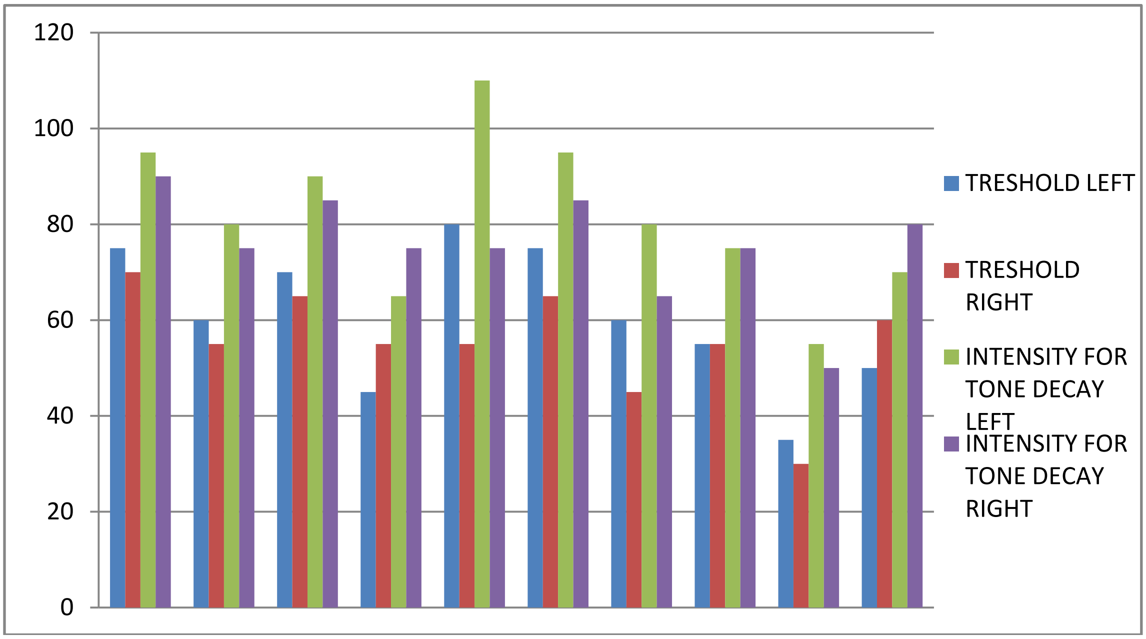
III. Graph & Conclusion

"ELKON EDA 3N3D DIAGNOSTIC Audiometer" is used for this work. It is computerized device. The invention of this device is credited by ELKON COMPANY.



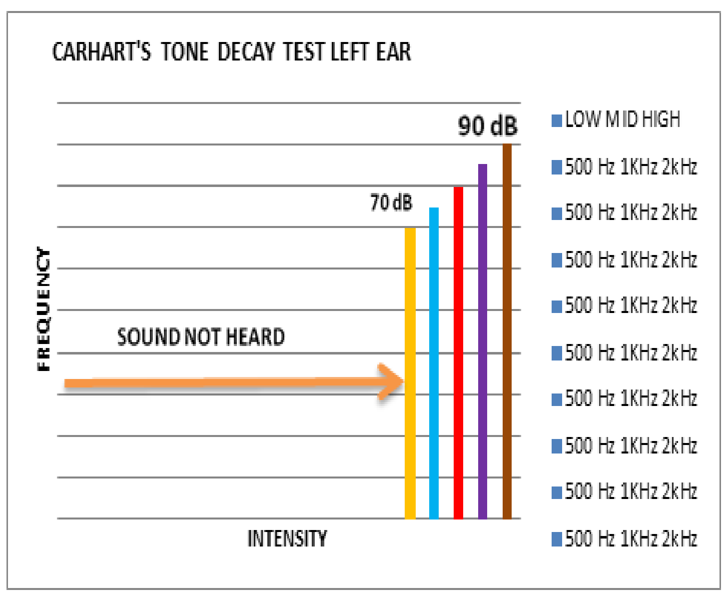
1. Carhart's Tone Decay Test (1957):

In this Test first Select the frequency & set the intensity at 5dB SL, then .Instruct the patient to raise his hand or press patients switch as long as he hears the signal. Even if the tonality of the signal changes to buzzing sound the patient should lower his hand or release the patient signal switch.

In this test the goal is to reach the intensity level at which the tone sensation & tonal quality is maintained during full 60 seconds.

Result: Values above 40 dB indicate neural losses.

CARHART TONE DECAY	FREQUENCY			INTENSITY LEFT
Patient 1	LOW	MID	HIGH	
AGE=64 YRS	500 Hz	1KHz	2kHz	
	500 Hz	1KHz	2kHz	
	500 Hz	1KHz	2kHz	
	500 Hz	1KHz	2kHz	
	500 Hz	1KHz	2kHz	
	500 Hz	1KHz	2kHz	
	500 Hz	1KHz	2kHz	
	500 Hz	1KHz	2kHz	
	500 Hz	1KHz	2kHz	
	500 Hz	1KHz	2kHz	
	500 Hz	1KHz	2kHz	
	500 Hz	1KHz	2kHz	
	500 Hz	1KHz	2kHz	
	500 Hz	1KHz	2kHz	70
	500 Hz	1KHz	2kHz	75
	500 Hz	1KHz	2kHz	80
	500 Hz	1KHz	2kHz	85
	500 Hz	1KHz	2kHz	90



REMARK: Intensity level at which the tone sensation & tonal quality is maintained during full 60 sec is above 40 dB. It indicates Neural Loss

2. Rosenbrg Tone Decay Method:

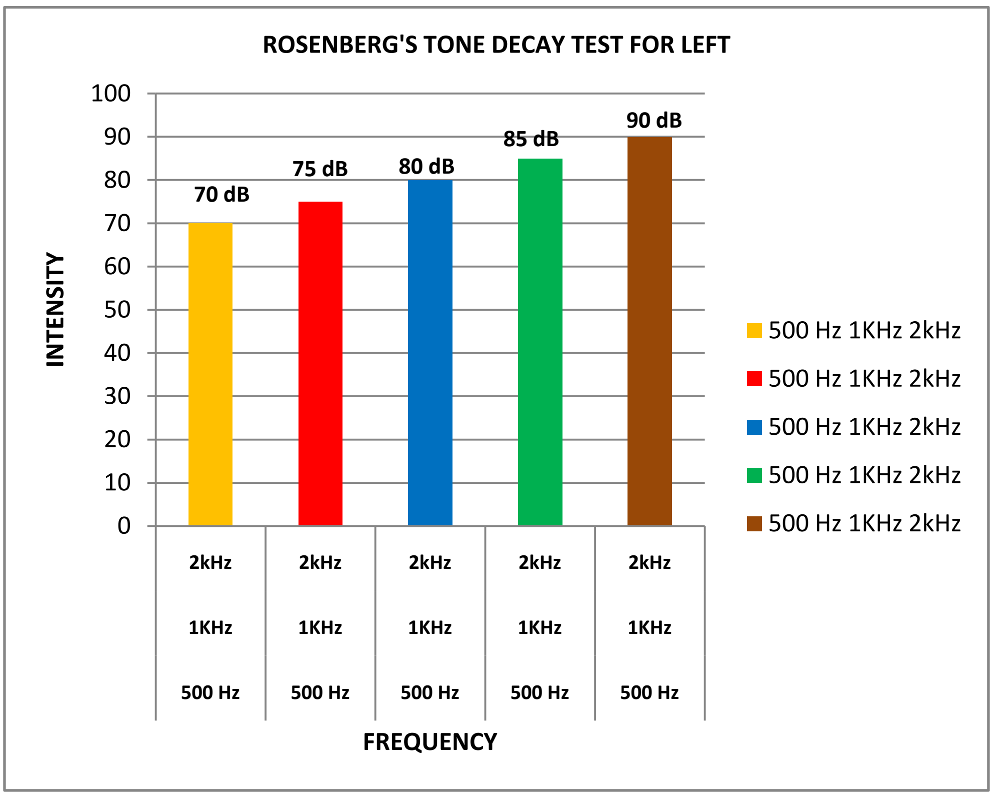
Procedure:

1. Starting intensity level is threshold.
2. Stimulation is continued up to 60 sec during which the intensity is increased whenever the patient fails to perceive the tone.
3. Adaptation value will correspond to the intensity increases during this one minute.

Result:

I. Normal value- 0 to 10 dB decay within 60 seconds
II. Cochlearlosses- 15 to 20 dB decay within 60 seconds.
III. Neurallosses -30 dB or greater within 60 seconds.

ROSENBERG	FREQUENCY			TRESHOLD dB
Patiant2	LOW	MID	HIGH	LEFT
AGE=64	500 Hz	1KHz	2kHz	70
	500 Hz	1KHz	2kHz	75
	500 Hz	1KHz	2kHz	80
	500 Hz	1KHz	2kHz	85
	500 Hz	1KHz	2kHz	90



REMARK: Left Ear Treshold is 70 dB & Intensity for Tone Decay is 90 dB , therefore decay show range 30 dB.So indicates Neural Loss.

3. Owen's Tone Decay Method:

It starts at Threshold; the difference is that 20 seconds rest period is advised previous to subsequently 5dB increment.

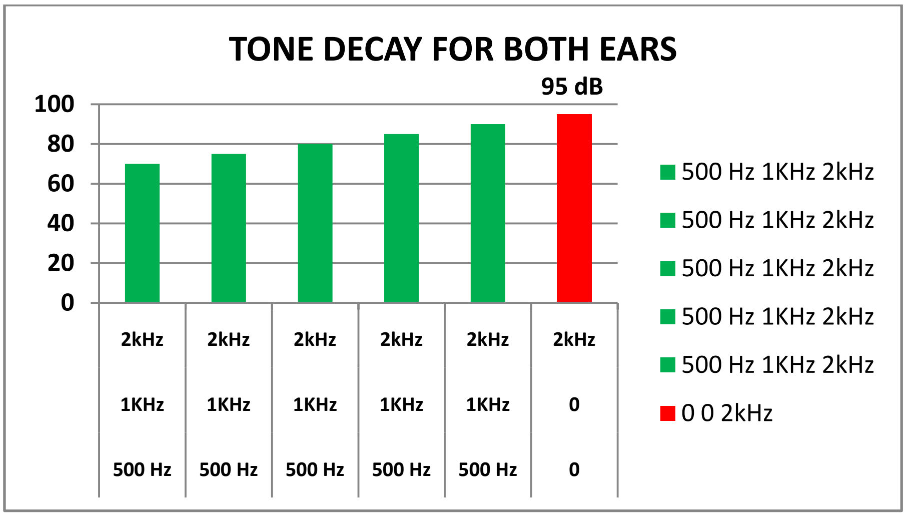
Result:

I. Normal Values -5dB decay
II. Cochlear losses-10 to 20 dB decay
III. Neural loss-25 dB or greater decay

Tone decay Test for object No 3: OWEN'S METHOD

Global Journal of Medical Research (D) Volume XVI Issue II Version I Year 2016

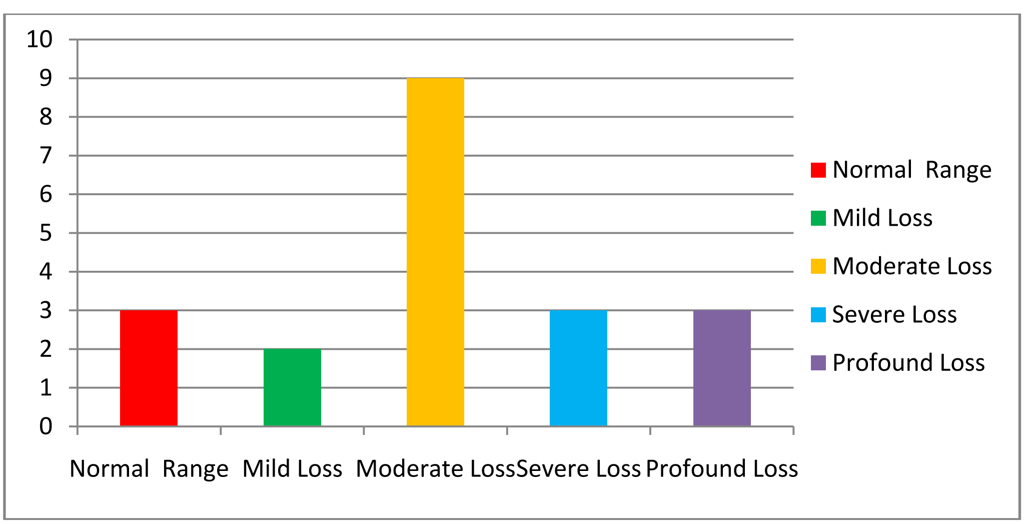
TONE DECAY	FREQUENCY			TRESHOLD
	LOW	MID	HIGH	LEFT
	500 Hz	1KHz	2kHz	70
	500 Hz	1KHz	2kHz	75
	500 Hz	1KHz	2kHz	80
	500 Hz	1KHz	2kHz	85
	500 Hz	1KHz	2kHz	90
	0	0	2kHz	95



REMARK: Each reading has taken with 20 sec rest period, Intensity level at which the tone sensation & tonal quality is maintained during full 60 sec is above 25 dB. It indicates Neural Loss.

OVERALL REMARK:

Range	Title	Sub No
0-20 dB	Normal Range	3
20-40 dB	Mild Loss	2
40-70 dB	Moderate Loss	9
70-90 dB	Severe Loss	3
90 db above	Profound Loss	3



IV. Conclusion

1. In this paper i have studied the 17 objects & Conclude the results for left and right ears, generally it is found that RIGHT ear has more hearing power as compare to LEFT ear.
2. All the tests are carried out for air conduction.
3. All the testes are carried out for evaluation of whole ear systems probably for outer ear, middle year, inner ear.
4. Aaged group people found Moderate Hearing Loss.
5. I have performed 3 tone decay test for each object out of which 4 are affected by Tone Decay.
6. If the test comes positive then the losses are found out &the object is suspected for Retro cochlear Pathology.

References Références Referencias

1. The book on audiometry.
2. http://www,entdev.uct.ac.za
3. www.clas.ufl.edu/users/sgriff/courses/SPA5304/3-speech.ppt
4. Gelfand, Stanley.essential of audiometry.

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Evaluation of Radiation Hazard Regarding the Differences of Radiation Doses Received by Thyroid Gland and Gonad for Male Patients Undergoing CT Scan Examination in Sardjito General Hospital Yogyakarta Province, Indonesia

By Ahmad Abdel Rahim Rashid Kittaneh, Arif Faisal & Kusminarto
Gadjah Mada University

Abstract- Background: The use of CT scan which is recognized as a high radiation dose modality has increased substantially over the past decade regardless to the high radiation levels received by patients. In CT scan, the potential damage from an absorbed dose during CT scan depends on the dose of radiation received and the sensitivity of different tissues and organs. The superficial organs such as thyroid and gonads have a higher sensitivity for radiation in CT scan that are significant enough to be matter of concern. Moreover, beyond certain thresholds, radiation can impair the functioning of tissues or organs and can produce acute hazard for deterministic effect.

Objectives: To evaluate the differences among radiation dose received by thyroid gland and gonad for male patient undergoing Brain, Chest, and abdominopelvis CT examination, and to determine if the doses will reach the maximum threshold of deterministic effects.

Keywords: *thyroid gland, gonads, radiation doses, brain CT, chest CT, abdominopelvis CT.*

GJMR-D Classification: *NLMC Code: WK 200*

Evaluation of Radiation Hazard Regarding the Differences of Radiation Doses Received by Thyroid Gland and Gonad for Male Patients Undergoing CT Scan Examination in Sardjito General Hospital Yogyakarta Province, Indonesia

Ahmad Abdel Rahim Rashid Kittaneh [α], Arif Faisal [σ] & Kusminarto [ρ]

Abstract- Background: The use of CT scan which is recognized as a high radiation dose modality has increased substantially over the past decade regardless to the high radiation levels received by patients. In CT scan, the potential damage from an absorbed dose during CT scan depends on the dose of radiation received and the sensitivity of different tissues and organs. The superficial organs such as thyroid and gonads have a higher sensitivity for radiation in CT scan that are significant enough to be matter of concern. Moreover, beyond certain thresholds, radiation can impair the functioning of tissues or organs and can produce acute hazard for deterministic effect.

Objectives: To evaluate the differences among radiation dose received by thyroid gland and gonad for male patient undergoing Brain, Chest, and abdominopelvis CT examination, and to determine if the doses will reach the maximum threshold of deterministic effects.

Material and Methods: The current study was conducted in Radiology Department, Philips brilliance MDCT scan has been used in Dr. Sardjito General Hospital. Calibrated RAD-60 dosimeter in May 2016 was used to measure the radiation dose for thyroid gland and gonads. There were 45 patients divided into three groups 15 for brain CT scan, 15 for chest CT scan, and 15 for abdominopelvis CT scan. The data obtained were analyzed using ANOVA and T-test.

Results: The differences in radiation dose received by thyroid gland and gonads between three groups ($P < 0.05$). The highest mean of radiation dose received by thyroid gland in brain CT (12±6 mSv), and the highest mean of radiation dose received by gonads in abdominopelvis CT (8 ±5 mSv). By using T-test one way to compare sample mean with population mean ($P < 0.05$) which means that the radiation dose received by thyroid gland was less than 0.065 Gy, and the radiation dose received by gonads was less than 0.1 Gy because ($P < 0.05$). From this study There were a wide differences between radiation dose received by thyroid gland and gonad for male patients undergone for CT scan examination. The major and important factors can affect to these differences was the distance. Fortunately, all of the maximum absorbed doses received by thyroid gland and gonads were less than the maximum thresholds of radiation hazard for deterministic effect, but the possibility cannot be excluded if multiple CT scan procedures are performed on the same patient.

Keywords: thyroid gland, gonads, radiation doses, brain CT, chest CT, abdominopelvis CT.

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I. Introduction

Computed tomography, more commonly known as a CT scan, is a kind of diagnostic imaging produces with multiple slice imaging techniques[1], and it has been recognized as a high radiation dose modality, when it compared with other diagnostic x-ray techniques. The multislice scanners has focused further attention on this issue, and it is generally believed that it will lead to higher patient doses, that can potentially cause higher risk to the patient due to increased capabilities allowing long scan lengths at high tube currents[2].

CT imaging involves the using of x-rays, which are a form of ionizing radiation. Ionizing radiation referred to radiation which has enough energy to remove an electron from a neutral atom or molecule, creating a free radical. Ionizing radiation is capable of creating DNA damage that can lead to cancer. Interaction between ionizing radiation and biological tissue and organs may affect the DNA structure, the cellular mechanisms and potentially cause harmful effects on living organisms[3]. These biological effects of radiation on human body can be divided into two categories, Stochastic effects and Deterministic effects[4]. Stochastic effects are malignant disease and heritable effects for which the probability of an effect occurring but not its severity[5]. In contrast, deterministic effects also called tissue reactions are those due to injury of a population of cells from radiation induced cell death or serious malfunction. Deterministic effects characteristically only occur above a threshold dose[6]. Moreover, the cell killing or induction of chromosomal damage is related to radiosensitivity of the organs. The superficial organs like thyroid gland, and gonad are more radiosensitive than other organs, so high doses of radiation can permanently damage normal thyroid gland or cause genetic mutations in the further generations for reproductive cells (gonad) [7-8]

II. Material and Methods

This is a cross sectional study that was conducted in Radiology Department in Dr. Sardjito General Hospital, Yogyakarta, Indonesia, to evaluate the differences of radiation dose received by thyroid gland and gonads for male patients underwent brain, chest, and abdominopelvis CT examinations. A Calibrated RAD-60 dosimeter which were performed by National Nuclear Energy Agency BATAN on May 2016. The RAD-60 was placed on patient thyroid gland and other one on patient gonads, and the equivalent dose was recorded after each examination.

Figure 1: RAD-60 dosimeter

The current study compares two groups (thyroid gland and gonad doses), using different types of CT scan examination, such as brain, chest, abdominopelvis CT scans by the influence of scanning parameters in CT scan, such as scan time, scan length, tube current, slice thickness, and pitch. The sample size was 45 patients, were qualified to inclusion and exclusion criteria.

This study obtained the permission from the Medical and Health Research Ethics Committee of Faculty of Medicine, Gadjah Mada University RSUP Dr. Sardjito hospital with certificate number KE/FK/769/EC/2016 on July 14, 2016.

III. Results

The percentage of the patients underwent scans with contrast, and the patients underwent scans without contrast. The total number of patients was 45, consisting of 12 patients were scanned without contrast (26, 7%), and 33 patients were scanned with contrast (73.3%). In each group from brain, chest, and abdominopelvis CT scan 15 patient were scanned. In brain CT scan 5 patients were scanned without contrast (33.3 %), and 10 patients were scanned with contrast (66.7 %). In abdominopelvis CT scan 3 patients were scanned without contrast 3 (20.0 %), and 12 patients were scanned with contrast (80.0 %). In chest CT scan 4 patients were scanned without contrast (26.7%) and 11 patients were scanned with contrast.

a) *Differences of doses received by thyroid gland and gonad*

The lowest mean radiation dose received by thyroid gland was 2±1 mSv in abdominopelvis CT scan for with and without contrast, and the highest mean radiation dose received by thyroid gland was 12±6 mSv in brain CT scan for with and without contrast . The $P < 0.05$; which mean there were differences between three groups. Whereas the lowest mean radiation dose received by gonads was 0.03±0.04 mSv in brain CT scan for with and without contrast scan, and the highest mean radiation dose received by gonads 8±6 mSv in abdominopelvis CT scan for with and without contrast. Figure (2).

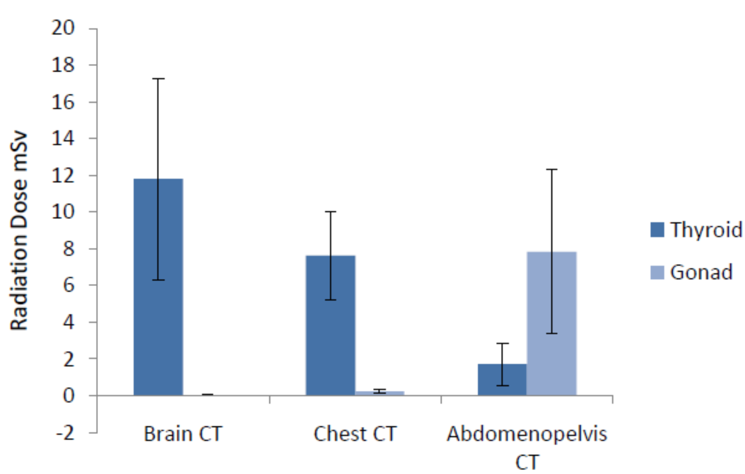

Figure 2: The differences of doses received by thyroid gland and gonad

b) Comparison between doses for scans with contrast and scans without contrast

The lowest radiation dose received by thyroid gland was 1± 0.4 mSv in abdominopelvis CT scan without contrast, and the highest radiation dose received by thyroid gland was 7 ± 2 mSv in brain CT scan without contrast. The $P < 0.05$; which mean there were differences between three groups. Whereas that the lowest radiation dose received by thyroid gland was 1±1 mSv in abdominopelvis CT scan with contrast, and the highest radiation dose received by thyroid gland was 8 ± 3 mSv in brain CT scan with contrast. The $P < 0.05$; which mean there were differences between three groups. For gonad, that the lowest radiation dose received by gonads was 0.02± 0.02 mSv in brain CT scan without contrast, and the highest radiation dose received by gonads was 3±2 mSv in abdominopelvis CT scan without contrast. Figure (3).

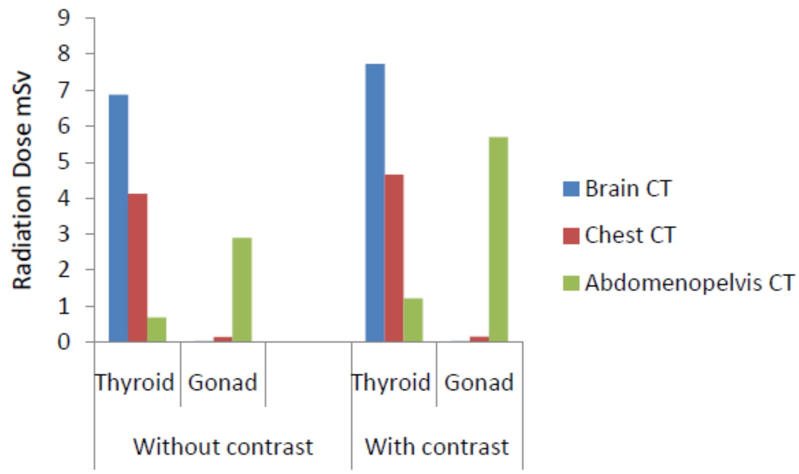

Figure 3: Comparison between doses for scans with contrast and scans without contrast

c) Scanning parameters

The mean of the highest mean of pitch in abdominopelvis CT scan 1 ± 0.05 and the lowest mean of scan time in brain CT scan 0.3±0.0. The $P < 0.05$; which mean there were differences between three groups Figure (4/A). For tube current (mA), the highest mean of tube current (mA) in chest CT scan 398±108 and the lowest mean of tube current (mA) in brain CT scan 259±0.0 The $P < 0.05$; which mean there were differences between three groups Figure (4/B). The mean of slice thickness in chest and brain CT scan 1.0±0.0mm, but in abdominopelvis CT scan 2.0±0.0 mm. Figure (4/C). The highest mean of scan length in abdominopelvis CT scan 443 ±32 mm, and the lowest mean of scan time in brain CT scan 239.0 ±14.1 mm. Figure (4/D). The scan time for each group was: Brain CT (17±1), chest CT (7 ±1), and abdominopelvis CT (9±1). One way ANOVA test showed The $P < 0.05$; which mean there were significant differences between three groups Figure (4/E).

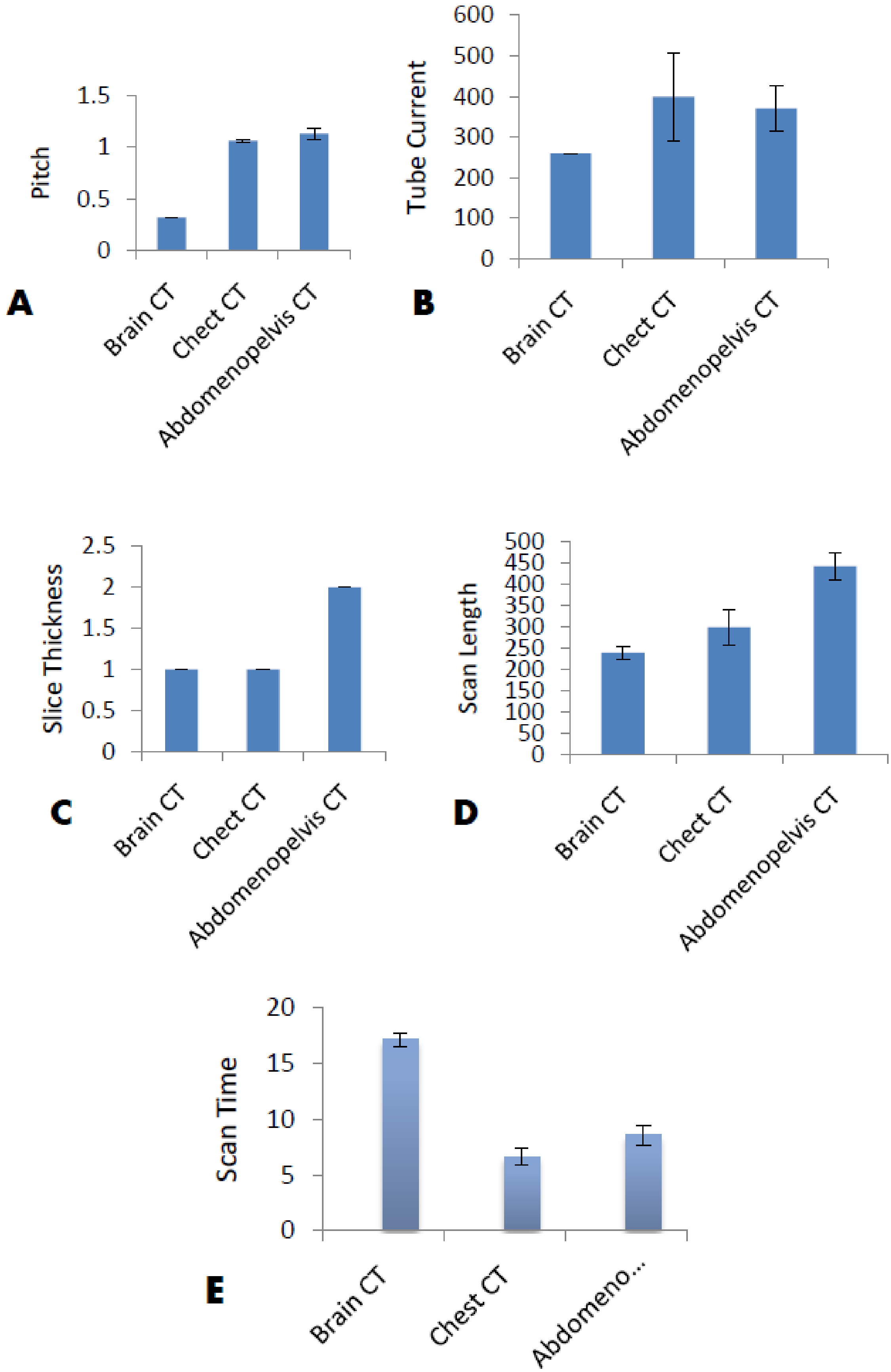

Figure 4: Scanning Parameters in CT scan

d) Radiation dose and scanning parameters for thyroid gland

The relationship between tube current with thyroid radiation dose was the highest in brain CT scan around 0.0088 mSv/s mm mm pitch, and in chest CT was 0.0032 mSv/s mm mm pitch. The scan length with thyroid radiation dose was the highest in brain CT scan around 0.0085 mSv/s mA mm pitch, and in chest CT was 0.0025 mSv/s mA mm pitch. The scan time with thyroid radiation dose was the highest in brain CT scan around 0.0005 mSv/mm mA mm pitch, and in chest, and abdominopelvis CT ware less than 0.0005 mSv/mm*mA*mm*pitch. For slice thickness and pitch the thyroid gland dose/scanning parameters was less than 0.0005 mSv/s*mA*mm*pitch for slice thickness and also less than 0.0005 mSv/s*mA*mm*mm for pitch Figure (5).

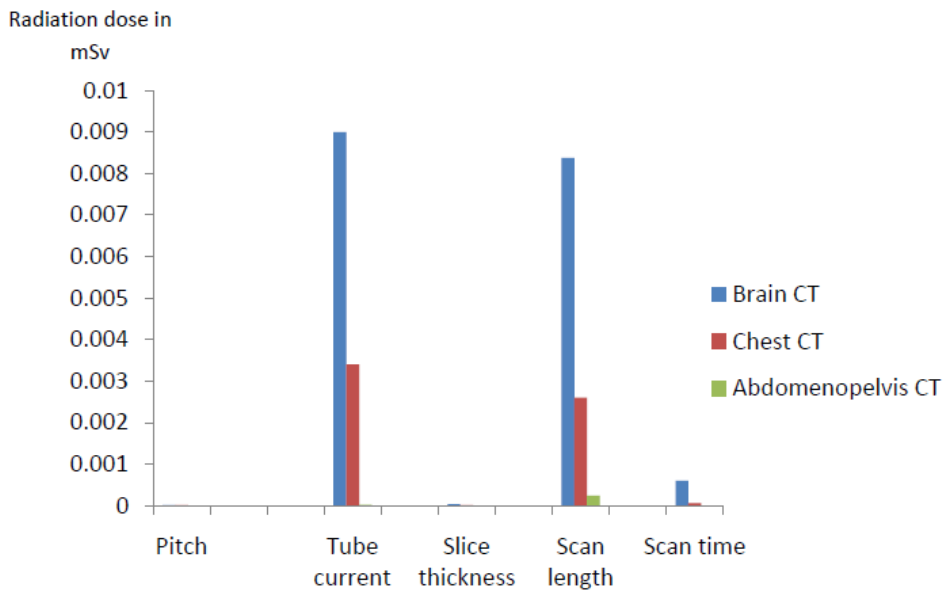

Figure 5: Radiation dose and scanning parameters for thyroid gland

e) Radiation dose and scanning parameters for gonad

The relationship tube current with gonad radiation dose was the highest in chest CT scan around 0.011 mSv/s mm mm pitch, and in abdominopelvis CT was arround 0.0003 mSv/s mm mm pitch. The scan length with gonad radiation dose was the highest in abdominopelvis CT scan around 0.0005 mSv/s mA mm pitch, and in chest CT was 0.00015 mSv/s mA mm pitch. The scan time, pitch, and slice thickness with gonad dose was approximately in similar value Figure (6).

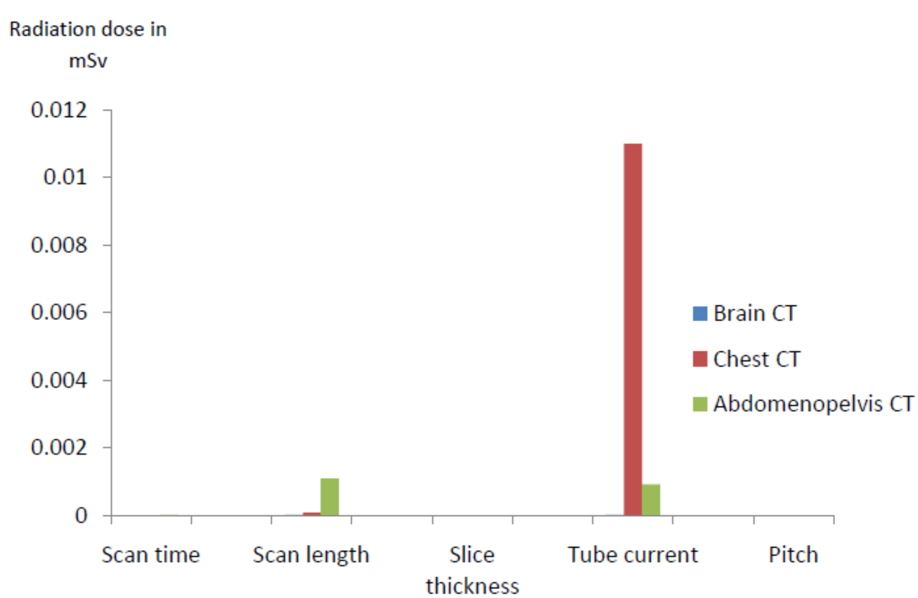

Figure 6: Radiation dose and scanning parameters for gonad

f) Absorbed dose and deterministic effect for thyroid gland and gonad

By using one sample T-test, this analysis is used to examine the mean difference between the sample and the known value of the population mean, and sample mean should be compared with the population mean. The mean of absorbed dose in (Gy) for gonad for three groups. In abdominopelvis radiation absorbed dose by gonad was 0.00078±0.0045 Gy, for chest CT scan was 0.0002±0.00011 Gy, and for brain CT scan was the lowest one was 0.0000±0.00004 Gy. the P value $P < 0.05$; which mean the sample mean was less than population mean which is equal 0.1 , 2, and 5 Gy.Figure (7/B)

The mean of absorbed dose in (Gy) for thyroid gonad for three groups. In abdominopelvis radiation absorbed dose by gonad was 0.0017 ± 0.0011 Gy, for chest CT scan was 0.0073 ± 0.0023 Gy, and for brain CT scan was the highest one 0.0118 ± 0.0054 Gy. The P value $P < 0.05$; which mean the sample mean was less than population mean which is equal 0.065 Gy. This value if absorbed by thyroid gland cells, the possibility of thyroid cancer will be increased around 15-53 %. Figure (7/A)

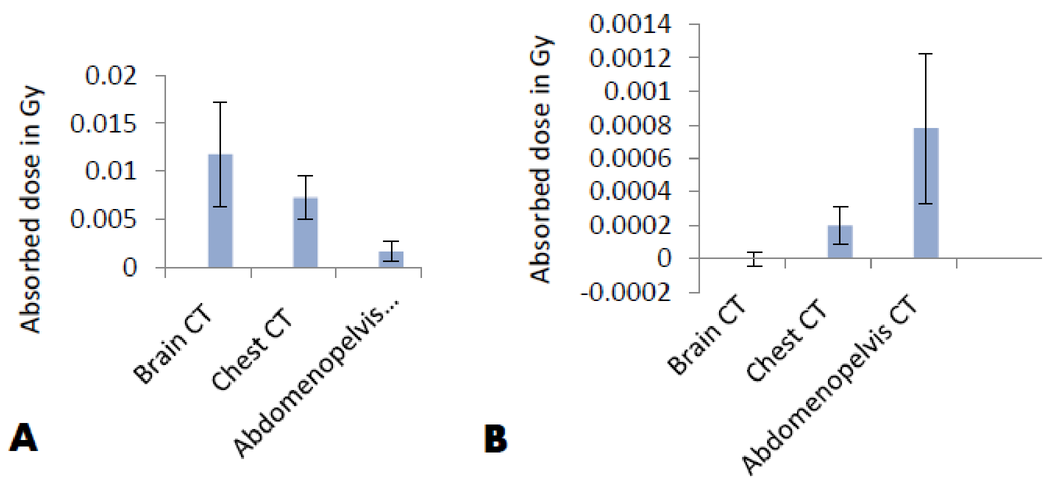

Figure 7: The absorbed dose in Gy. A. For thyroid gland, and B. for gonad

IV. Discussion

Radiation dose from CT procedures varies from patient to patient. The particular radiation dose received by organs depend on the size of the body part being examined, organ location, the type of procedure, and other factors. Typical values cited for radiation dose should be considered as estimation that cannot be precisely associated with any individual patient examination.

a) Scanning parameters in CT scan and radiation dose received by thyroid gland and gonad

This study showed that sizable differences in thyroid gland and gonad dose exist among different types of CT examination such as brain, chest, and abdominopelvis CT scan. The differences of radiation dose depend on the scanning parameters such as exposure factors, distance, Pitch, scan length, and scan time.

1. *Exposure factors:* The selection of tube voltage kVp determines the energy of the x-rays reaching the patient. Increase in kVp, the radiation dose to the patient will increase so the dose in CT is directly proportional to square of kVp9. However, mA is adapted to body parts, thinner parts need less radiation With increasing mA, patient organ dose increased10. The relationship between tube current and radiation dose received by thyroid gland was highly in brain CT scan which was around 0.0088 mSv/s mm mm pitch. Whereas the relationship between tube current and radiation dose received by gonad was highly in chest CT scan which was around 0.011 mSv/s mm mm pitch, but in abdominopelvis CT scan 0.00092 mSv/s mm mm pitch, so even though the tube current was high, there was no strong significant between tube current in abdominopelvis CT and radiation dose received by gonad 0.00092 mSv/s mm mm pitch.
2. *Scan length:* The scan length is defined as the volume that is irradiated along the cranio-caudal axis of the patient. Radiation dose is directly proportional to the scan length11. The mean scan length in abdomiopelvis CT scan was the highest (443±32) mm, whereas the mean of scan length in chest CT scan is (299±42) mm, and in brain CT scan was (239±14) mm. There was a strong relationship between scan length and radiation dose received by thyroid gland was highly in brain CT scan which was around 0.00838 mSv/s mm mA pitch. Whereas the relationship between scan length and radiation dose received by gonad was highest in abdominopelvis CT scan which was around 0.011 mSv/s mm mA pitch.

3. *Pitch:* Patient dose is inversely proportional the pitch. Larger pitches lower the radiation dose, and it has directly relationship with tube current mA when pitch increase the mA decrease12. The highest mean of pitch was in chest CT scan (1.068±0.02) which was less than the mean of pitch in abdominopelvis CT scan which was (1.13±0.05), and in brain CT scan the mean of pitch was (0.32±0.00). The relationship between pitch and radiation dose received by thyroid gland and gonad was not highly significant like others factors. As shown in results that the highest radiation dose received by thyroid gland in brain CT scan was 0.000011 mSv/s mm mm mA because it was the lowest pitch 0.32
4. *Slice thickness:* slice thickness reducing of can increase the dose exponentially13. This study showed the mean of slice thickness in chest CT scan was the same of brain CT was (1±0.00 mm), and in abdominopelvis CT scan was (2±0.00 mm). The relationship between slice thickness and radiation dose received by thyroid gland and gonads was not highly significant like others factors .The highest normalized dose with slice thickness was in brain CT scan was 0.000035 mSv/s pitch mm mA. the highest radiation dose received by gonad in abdominopelvis CT 0.0000049 mSv/s pitch mm mA.
5. *Scan time:* scan time contributes to an increased patient dose if the time is increased, so the scan time is an important factor in limiting exposure to the public and to radiological emergency responders14. The highest mean of scan time in this study for brain CT scan which was (17±059) second, in chest CT scan was (7±1) second, and in abdominopelvis CT scan was (9±1) second. There was a strong relationship between scan time and radiation dose received by thyroid gland was highly in brain CT scan which was around 0.000595 mSv/mm mm mA pitch, in chest CT scan was 0.000057 mSv/mm mm mA pitch, and for abdominopelvis was the lowest one 0.0000046 mSv/mm mm mA pitch. Whereas the relationship between scan time and radiation dose received by gonad was not strong like in thyroid gland, the highest was in abdominopelvis CT scan which was around 0.0000211mSv/mm mm mA pitch.

There was an important point that gonad can received more radiation dose in abdominopelvis CT scan even there was no strong relationship between scanning parameters and radiaton dose like in brain CT and radiation dose received by thyroid gland. The interpretaion of this was the radiation doses received by thyroid gland in brain CT and chest CT was a scatter radiation because the thyroid gland was not included in scan, while in the gonad was included in abdominopelvis CT scan so the radition received was directly from the scan.

b) Radiation dose received by thyroid gland and gonads and radiation hazards for deterministic effects

Despite the clear evidence that CT provides invaluable information for diagnosis and patient management, a potential risk of radiation-induced malignancy exists. CT contributes a large part of the collective dose, in some countries it amounts to 70% of the dose from medical procedures; the individual patient skin dose in a single procedure is far below that which should cause concern for deterministic injury[13]. A deterministic effect is a somatic effect that increases in severity with increasing dose in the affected individual. The severity is related to the number of cells and tissues damaged by the radiation. Larger doses of radiation are usually required to cause a significant deterministic effect or to seriously impair health than are required to increase cancer or mutation risks[14].

Radiosensitivity is the relative susceptibility of cells, tissues, organs, organisms, or any other substances to the effects of radiation. Radiosensitivity is highest in cells which are highly mitotic or undifferentiated[16-17]. Thyroid gland and gonad are a sensitive organs for ionizing radiation at a young age is a recognized risk factor for the development of differentiated thyroid cancer when the radiation dose absorbed in the thyroid area is 0.065 Gy18. Whereas for gonad the reproductive cells absorb around 0.1 Gy will cause the hereditary effects from radiation exposure could result from damage of chromosomes in the exposed person's reproductive cells (Meistrich, 2009), while if it absorb 2 Gy will cause the temporal sterility for 12 months, and dose around 6 Gy cause permanent sterility8. This study showed that the radiation dose for thyroid gland was evaluated and the maximum in brain CT scan which was equal 0.011 Gy this value was below the values of radiation hazard for deterministic thyroid cancer 0.065 Gy. Whereas the highest absorbed dose for gonads 0.0045 Gy was less than the values of radiation hazard for deterministic of genetic mutation 0.1 Gy, temporal sterility 2 Gy, and permanent sterility 5 Gy, but The possibility of such deterministic effects cannot be excluded if multiple CT scan procedures are performed on the same patient13.

V. Conclusion

1. There were a wide differences between radiation dose received by thyroid gland and gonad for male patients underwent CT scans. The major factor for these differences was the distance because the intensity of radiation decrease when the distance from the source increase. Moreover, there was a strong relationship between radiation dose received by thyroid gland and scanning parameters, because

thyroid gland was not included in the scan. Whereas in gonad there was no strong relationship between scanning parameters, but can receive more radiation dose in abdominopelvis CT scan because gonad was included in the scan so the radiation received was directly from the scan.

2. The maximum absorbed doses by thyroid gland and gonad in CT scans were less than the maximum thresholds of radiation hazard for determinestic effect, but The possibility of such deterministic effects cannot be excluded if multiple CT scan procedures are performed on the same patient.

VI. Acknowledgement

First of all, I would like to thank Allah for giving me the strength and courage to be persevere throughout the duration of my study.

Acknowledging greatest thanks to my father who has been my source of inspiration because of his continuous support and encouragement. My lovely mother who has dedicated all her life with sweat and blood to her sons. My brothers, and my sisters who have showed me their determination in which gave me confidence to pursue my study.

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References Références Referencias

1. Sandborg M. Computed Tomography: Physical principles and biohazards. Department of Radiation Physics.1995; Faculty of Health Sciences. Linköping University, Sweden
2. Lewis M. Radiation dose issues in multi-slice CT scanning. Medicine and Healthcare Products Regulatory Agency. 2005; Retrieved from http://www.impactscan.org/download/msctdose.pdf.
3. Russ A. Burns C. Tuler S. and Taylor O. Health Risks of Ionizing Radiation: An Overview of Epidemiological Studies, Community-Based Hazard Management 2006; The George Perkins Marsh Institute, Clark University, USA.
4. International Commission on Radiological Protection [ICRP]. New ICRP recommendations. *J Radiol Prot*. 2008; (28) 161–8.
5. International Commission on Radiological Protection [ICRP]. Radiological Protection in Cardiology. 2013; Retrieved from http://radon-and-life.narod.ru/pub/ICRP_120.pdf.
6. Einstein A J. Effects of Radiation Exposure From Cardiac Imaging: How Good Are the Data?. *J Am Coll Cardiol*. 2013; (6) 553–6.
7. Nachalon Y, Hilly O, Segal K, Raveh E, Hirsch D, Robenshtok E, Shimon 1,
8. Nais A H W. Introduction to Radiobiology. 1998; Second Edition. Baffins Lan, Chichester, west Sussex. p. 236.
9. Sherer M A S, Visconti P J, Ritenour E R. Radiation Protection in Medical Radiography. 2011; Publishing Services Manager: Catherine Jackson. Sixth edition.
10. Shivapriya N. The mA and kVp of radiation dose. 2004; Retrieved from: http://www.auntminnie.com/index.aspx?sec=ser&sub=def&pag=dis&ItemID=62370.
11. Shahriari M, Ay M R, Sarkar S. Ghafarian P. Measurement of organ dose in abdomen-pelvis CT exam as a function of mA, KV and scanner type by Monte Carlo method. *Iran. J. Radiat. Res.* 2004;(4): 187-19
12. Rajan G, Izewska J. Radiation Oncology Physics: A Handbook for Teachers and Students. 2007; Chapter 4. Radiation Monitoring Instruments. P. 85-86
13. Coursey C A, Donald P, Frush D P. CT and Radiation: What Radiologists Should Know. *Appl Radiol*. 2008; (3):22-9.
14. ICRP. Managing Patient Dose in Multi-Detector Computed Tomography (MDCT). 2006; Retrieved from: http://www.icrp.org/docs/icrp-mdct-for_web_cons_32_219_06.pdf.
15. Grover S B, Kumar J, Gupta A, Khanna L. Protection against radiation hazards: Regulatory bodies, safety norms, does limits and protection devices. *Indian J. Radiol. Imaging*. (2002); 12: 157-16.
16. Hall E J, Giaccia A J. Radiobiology for the Radiologist. 2006; Lippincott. Williams & Wilkins, p. 17.
17. Mosier-Boss P A, Szpak S, Gordon F E, Forsley L P G. Mosby's medical dictionary. Elsevier 2009; 8th edition.
18. Goodman T R. Ionizing Radiation Effects and Their Risk to Humans.2010; Yale University School of Medicine, New Haven. Retrieved frohttp://www.imagewisely.org/imaging-modalities/computed-tomography/imaging-physicians/articles/ionizing-radiation-effects-and-their-risk-to-humans
19. Nachalon Y, Shimon I, Robenshtok E, Hilly O, Segal K, Shvero J, Benbassat C, Popovtzer A. Radiation-Induced Well-Differentiated Thyroid Cancer:Disease Characteristics and Survival . *Israel Med Assoc J*. 2016; (18): 90-1.

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An Extensive Review of Medical Image Denoising Techniques

By Mohd. Ameen & Shah Aqueel Ahmed
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Abstract- Image denoising is an important pre-processing step in medical image analysis. The basic intent of image denoising is to reconstruct the original image from its noisy observation as accurately as possible, while preserving important detail features such as edges and textures in the denoised image. In medical imaging, for the precise analysis of diseases denoising of medical images like X-RAY, CT (Computed Tomography), MRI (Magnetic Resonance Imaging), PET (Positron Emission Tomography) and SPECT (Single Photon Emission Computed Tomography) is essential since a small lose of a particular area in case of medical images may results in immense disaster similar to death. To mitigate such threat over the last few decades, image denoising has been extensively studied in the image and signal processing community and suggested various denoising techniques. Each approach has its assumptions, advantages, and limitations. In this paper a detailed survey has been carried out on various image denoising approaches and their performances on on medical images.

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I. Introduction

Digital images play an important role both in daily life applications such as satellite television, magnetic resonance imaging, and computed tomography as well as in areas of research and technology such as geographical information systems and astronomy. Noise removal is one of the very important aspect in the field of image processing. An image gets distorted with different types of noise during the process of transmission and reception. Noise may be classified as substitutive noise speckle noise and additive white Gaussian noise.

Therefore, denoising of medical images is further essential which leads physician for precise analysis of diseases. Medical images like X-RAY, CT (Computed Tomography), MRI (Magnetic Resonance Imaging), PET (Positron Emission Tomography) and SPECT (Single Photon Emission Computed Tomography) encompass diminutive information about heart, brain, nerves and more. For determining the internal structure of an object, X-ray Computed Tomography (CT) is a powerful method. As such it determines application, e.g. in the non-destructive testing of a variety of materials. From a huge number of systematic observations at diverse viewing angles, the CT image is derived, and with the support of a computer (Radon transform) the final CT image is then reconstructed. It is unfeasible to rescue a human being from harmful effects, when these medical images are corrupted by noise. In both Image Processing and Biomedical Engineering, CT image Denoising is a significant research theme. In the case of CT, numerous mathematical applications can be applied to conclude whether the normal tissue has been infected by the mutations of the cancer cell. The disease diagnosis procedure has been made more efficient by denoising the CT images where the noise is removed. The denoised images encompass a prominent level of elevation in its PSNR values, ensuring a smoother image for diagnosis function. For developing the quality of the CT images, a variety of methods have been established. While many algorithms have been proposed for the purpose of image denoising, the problem of image noise suppression remains an open challenge, especially in situations where the images are acquired under poor conditions where the noise level is very high. In this paper, we present a broad review of medical image denoising is presented in spatial domain and transform domain and each has their own assumptions, limitations and advantages. The rest of the paper is structured as follows. Section II briefly gives the literature reviews of the denoising techniques Section III presents the taxonomy of linear model of LPG-PCA denoising algorithm in detail. Section IV gives the direction to the research work in order find a appropriate non-linear denoising technique and Section V concludes the paper

II. Literature Survey

Pravin R. Dabhi at el. (2015), author worked on satellite images which as many applications such as in meteorology, oceanography, fishing, agriculture, biodiversity conservation, forestry, landscape, geology, cartography, regional planning, education, intelligence and warfare. Images can be in visible colors and in other spectra. There are also elevation maps, usually made by radar images. Low resolution is the major drawback in these kinds of images. The resolution of satellite images varies depending on the instrument used and the altitude of the satellite's orbit. In order to exploit the information and to analyze the image the resolution of the image has to be enhanced. Various image processing techniques exist for resolution enhancement. The latest being application of wavelet techniques for

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resolution enhancement. In this, a comparison of two main wavelet techniques i.e. DWT & SWT are studied based on the image quality metrics and a new image quality enhancement technique had been worked based on wavelet fusion algorithm. The computation results of the image enhancement and image quality metrics of the proposed technique is compared with existing techniques. It is proved that the proposed technique have higher resolution enhancement capability than existing techniques.

Mirajkar Pradnya P (2013, defined Image fusion is the procedure of combining two or more unlike images into a new single image retaining their main features from each part of images with extensive information content. Two approaches of image fusion, Spatial Fusion and Transform fusion. Here, proposed an image fusion approach based on Stationary Wavelet Transform (SWT) that is firstly applied with the original image to get the edge image information in level 1 and level 2 both. Next, both edge images are combined to get a complete edge image using Spatial Frequency Measurement, which is compared with a few simple fusion Methods.

B Siva Kumar et al. (2013, proposed an image resolution enhancement technique based on interpolation of the high frequency subband images obtained by discrete wavelet transform (DWT) and the input image. The edges are enhanced by introducing an intermediate stage by using stationary wavelet transform (SWT). DWT is applied in order to decompose an input image into different subbands. Then the high frequency subbands as well as the input image are interpolated. The estimated high frequency subbands are being modified by using high frequency subband obtained through SWT. Then all these subbands are combined to generate a new high resolution image by using inverse DWT (IDWT). The quantitative and visual results are showing the superiority of the proposed technique over the conventional and state- of art image resolution enhancement techniques.

Kanagaraj Kannan et al. (2010, introduced the fast development of digital image processing leads to the growth of feature extraction of images which leads to the development of Image fusion. The process of combining two different images into a new single image by retaining salient features from each image with extended information content is known as Image fusion. Two approaches to image fusion are Spatial Fusion and Transform fusion. Discrete Wavelet Transform plays a vital role in image fusion since it minimizes structural distortions among the various other transforms. Lack of shift invariance, poor directional selectivity and the absence of phase information are the drawbacks of Discrete Wavelet Transform. These drawbacks are overcome by Stationary Wavelet Transform and Dual Tree Complex Wavelet Transform. This paper describes the optimal decomposition level of Discrete, Stationary and Dual Tree Complex wavelet transform required for better pixel based fusion of multi focused images in terms of Root Mean Square Error, Peak Signal to Noise Ratio and Quality Index.

Lei Zhang et al.(2010) et.al. had analyzed and developed an efficient PCA-based denoising method with local pixel grouping (LPG). PCA is a classical de-correlation technique in statistical signal processing and it is pervasively used in pattern recognition and dimensionality reduction. By transforming the original dataset into PCA domain and preserving only the several most significant principal components, the noise and trivial information can be removed. However, the PCA based scheme applies directly to the noisy image without data selection and many noise residual and visual artifacts will appear in the denoised outputs. In order to overcome this problem they enhanced by encapsulating the LPG (Local Pixel Grouping) method for selecting the local statistical feature group. In the enhanced LPG-PCA method they model a pixel and its nearest neighbors as a vector variable. The training samples of this variable are selected by grouping the pixels with similar local spatial structures to the underlying one in the local window. With such an LPG procedure, the local statistics of the variables can be accurately computed so that the image edge structures can be well preserved after shrinkage in the PCA domain for noise removal.

K.Prasad (2012), main work is of the image denoising. Corrupted image is called the noisy image, and the corrected is called the de-noised image. As we know different types of noises are there in the image processing like Gaussian noise, speckle noise, random noise, Salt & pepper noise etc. Among these the Salt and pepper noise is very dangerous noise compare to other noises. By using different algorithms we can reduce the noise from image. As color images in image processing is very widely as applications. So, a modified decision based unsymmetrical trimmed median filter algorithm for the restoration of gray scale, and color images that are highly corrupted by salt and pepper noise has worked out. Algorithm is worked which replaces the noisy pixel by trimmed median value when other pixel values, 0's and 255's as present in the selected window and when all the pixel values are 0's and 255's then the noise pixel is replaced by mean value of all the elements present in the selected window. Here algorithm shows better results than previous algorithm as tested against different grayscale and color images and gives better Peak Signal to-Noise Ratio (PSNR) and Image Enhancement Factor (IEF). So, MDBUTMF algorithm is effective for salt and pepper noise removal in images at high noise densities.

S. Preethi et al. (2012) proposed a Non linear model for denoising images mainly of medical images. While developing anon-linear model they have extensive literature survey for various image denoising processes and based on similarity measures like PSNR, SSIM, SNR the PCA based NL-PCA provides better results in terms of image quality and similarity measures.

Rajenda Pandit et al. (2013), this paper discusses the Formulation, Process Flow Diagrams and algorithms of PCA(principal Component Analysis), DCT (Discrete Cosine Transform) and DWT (Discrete Wavelet Transform) based image fusion techniques. In this work they did the comparative study of PCA based image denoising techniques using DCT and DWT. After comparison they concluded giving upper hand to PCA-DWT based method over DCT based method.

G.Amar Tej (2015), preprocessing techniques hire filtration and resolution enhancement to remove noise and have good resolution is the main quality parameters in medical images. So as to preserve the edges and contour information of the medical images, an improved image enhancement technique and the efficient denoising is required. Here, concentrate on the average filtering, median filtering, wiener filtering and wavelet denoising for image denoising and an interpolation based Discrete and stationary Wavelet Transform technique for resolution enhancement is calculated on the base of some performance parameters such as PSNR which provides efficient denoising and resolution enhancement for image preprocessing.

Ashish goud Purushotham (2015), result of fusion is a new image which is more suitable for human and machine perception. Pixel level image fusion using wavelets and principal component analysis have implemented and worked on different performance metrics with and without reference image which concluded that image fusion using wavelets with higher level of decomposition showed better performance in some metrics and in other metrics PCA showed better performance. DWT in all parameters performs better than the PCA fusion algorithm so finally we can conclude that DWT is performs better than PCA.

III. Taxonomy of LPG-PCA Based Medical Image Denoising Technique

Principal Component Analysis (PCA) is a second order statistical approach, which has been used to extract the features of data set or perform data reduction (compression). Specially, when data set is, redundant and overwhelming large, PCA is very effective linear technique as a preprocessing step to extract data features and to cluster data for classification. It can play as optimal linear transform known as Kahunen- Louvre (LK) for data compression. To obtain the principal component vectors, traditionally the covariance matrix is calculated then eigen values are obtained, and corresponding to each eigen value, a component (eigen) vector is found. This procedure is complicated and computationally intensive thereby making it restrictive to apply for real world applications such as data compression and data extraction.

Moreover, the PCA hardware implementation for real time application becomes even more challenging. To get over the hurdles from the traditional PCA technique, the simple sequential PCA techniques are introduced. These techniques are based on learning approach to obtain sequentially principal component vectors. Some works in PCA are reported using Hebbian or anti-Hebbian learning and gradient-based learning. There are several reports that are successful in using PCA for data reduction and detection. Most of the works are software-based due to the complication of the hardware requirements.

In LPG-PCA scheme, a pixel and its nearest neighbors as a vector variable is obtained. The training samples of this variable are selected by grouping the pixels with similar local spatial structures to the underlying one in the local window. With this LPG procedure, the local statistics of the variables can be accurately computed so that the image edge structures can be well preserved after shrinkage in the PCA domain for noise removal

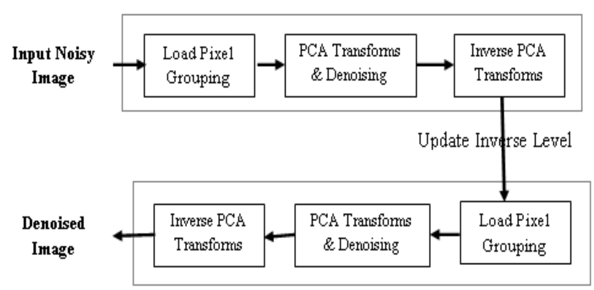

Fig.1: Process flow of CT Image Denoising using PCA

This LPG-PCA algorithm consists of two stages. The first stage yields an initial estimation of the image by removing most of the noise and the second stage will further refine the first stage output. The procedures of both the stages have the same except for the parameter of noise level. Since the noise is significantly reduced in the first stage, the LPG accuracy will be much improved in the second stage so that the final denoising result is visually much better. This method is a spatially adaptive image representation so that it can better characterize the image local structures.

In image denoising by using local pixel grouping using principal component analysis (L.Zang et al. 2010) the main steps are

1) LPG (Local Pixel Grouping)
2) Apply PCA transform and denoise
3) Apply Inverse PCA transform

In order to calculate the local statistics in LPG-PCA method a moving window is used from which the

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local PCA transformation matrix was estimated. The process of denoising in LPGPCA algorithm get completed in two stages,

1. In the first stage it gives an initial estimation of the image by removing most of the noise and
2. Second stage will further refine the output of the first stage 1 (L.Zang et al. 2010).

Steps involved in calculation of PCA are:

1) Subtraction of mean
2) Calculation of covariance matrix
3) Calculation of eigen vector and eigen values.
4) Multiply eigen vector and image

Noise is suppressed by using linear minimum mean square error estimation (LMMSE) technique. Shrinkage coefficient is multiplied with covariance values and then mean values are added back to get denoised dataset.

IV. Directions for the Future Research

In this review paper, different methods developed for denoising the medical images are thoroughly analyzed. Analysis has been done on the Radiography, Ultrasound, MRI and CT images are analyzed. Besides others, the CT image plays a more important role because it is one of the most common and very significant modalities employed in medical imaging. Hence due to its prevalent utilization, obtaining better results is essential for CT images. This paper will be a healthier foundation for the budding researchers in identifying appropriate denoising techniques for medical images and especially for CT images. In future we expect numerous brainwaves will rise by means of our review work.

V. Conclusion

From thorough analysis it is perceived that the medical image denoising is an emergent research area and has received great attention among the researchers from image and signal processing in recent years. As such, a broad review of the significant researches and techniques that exist for medical image denoising is pursued. Here the researches are first categorized into Radiographic, Ultrasound, MRI and CT images based on the type of the medical image. Then, followed by a concise description on digital images and medical images and a brief discussion about each category of medical images the salient features of the important researches existing in the literature are reviewed.

References Références Referencias

1. M. Zahid Alam, Ravi Shankar Mishra, AS Zadgaonkar "Image Denoising using Common Vector Elimination by PCA and Wavelet Transform" International Journal on Emerging Technologies 6(2): 157-164(2015).
2. Nishu Rani, Rachna Rajput "Improving Quality of Image Using PCA and DSWT at Two Level Decomposition" International Journal of Innovative Research in Computer and Communication Engineering Vol. 4, Issue 9, September 2016 DOI:10.15680/ijircce.2016.040903316229.
3. Pravin R. Dabhi, S G. Bari," Resolution Enhancement of High Noise Satellite Images Using DT-DWT Based Fusion Algorithm", JETIR, Volume 2, Issue 4, ISSN-2349-5162, April 2015.
4. Mirajkar Pradnya P," Image Fusion based on Stationary Wavelet Transform", International Journal of Advanced Engineering Research and Studies, II/ IV/July-Sept., 2013/99-101.
5. B Siva Kumar," Discrete and Stationary Wavelet Decomposition for IMAGE Resolution Enhance ment", International Journal of Engineering Trends and Technology (IJETT) – Volume 4 Issue 7- July 2013.
6. Kanagaraj Kannan," Optimal Decomposition Level of Discrete, Stationary and Dual Tree Complex Wavelet Transform for Pixel based Fusion of Multi-focused Images", Serbian Journal of Electrical Engineering vol. 7, No. 1, May 2010, 81-93.
7. Lei Zhang, David Zhang, Guang ming Shi "Two-stage image denoising by principal component analysis with local pixel grouping" Pattern Recognition 43 (2010) 1531–1549 Elsevier Ltd. All rights reserved. doi: 10. 1016/j.patcog.2009.09.023.
8. S. Preethi, D. Narmadha, "A Survey on Image Denoising Techniques" International Journal of Computer Applications (0975 – 8887) Volume 58– No. 6, November 2012.
9. A. Velayudham, R. Kanthavel A Survey on Medical Image Denoising Techniques" International journal of Advanced research in Electronics and Communication Engineering (IJARECE) Volume 2, Issue 3, March 2013 272.
10. G. Amar Tej, Prashanth. K. Shah, "Efficient quality analysis and enhancement of MRI image using Filters and Wavelets", International Journal of Advanced Research in Computer and Communication Engineering, Vol. 4, Issue 6, June 2015.
11. Ashishgoud Purushotham G. Usha Rani Samiha Naik, "Image Fusion Using DWT & PCA", International Journal of Advanced Research in Computer Science and Software Engineering, Volume 5, Issue 4, 2015.
12. K. Fukunaga, Introduction to Statistical Pattern Recognition, second ed, Academic Press, New York, 1991.
13. R.C. Gonzalez, R.E. Woods, Digital Image Processing, second ed., Prentice- Hall, Englewood Cliffs, NJ, 2002.
14. Malay K. Pakhira, "Digital Image Processing and Pattern Recognition", PHI Learning Pvt. Ltd., 2011.

15. Anil Jain K. “Fundamentals of Digital Image Processing”, PHI Learning Pvt. Ltd., 2011. Bhabatosh Chanda, Dwejesh Dutta Majumder, “Digital Image Processing and analysis”, Second Edition, PHI Learning Pvt. Ltd., 2011.
16. S. Annadurai, R. Shanmugalakshmi, "Fundamentals of Digital Image Processing", Pearson Education, 2007.
17. Rachana Dhannawat, Archana B. Patankar,“ Improvement to Blind Image Denoising by Using Local Pixel Grouping with SVD” Procedia Computer Science 79 (2016) 314 – 320 Published by Elsevier B.V. doi: 10.1016/j.procs.2016.03.041.

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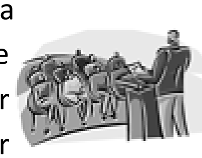

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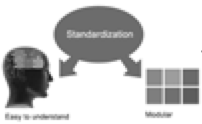

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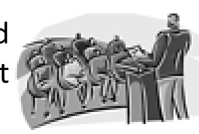

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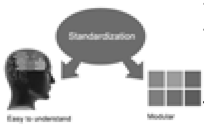

After nomination of your institution as "Institutional Fellow" and constantly functioning successfully for one year, we can consider giving recognition to your institute to function as Regional/Zonal office on our behalf.
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The following entitlements are applicable to individual Fellows:

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- • This individual has learned the basic methods of applying those concepts and techniques to common challenging situations. This individual has further demonstrated an in–depth understanding of the application of suitable techniques to a particular area of research practice.

Note :

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- In future, if the board feels the necessity to change any board member, the same can be done with the consent of the chairperson along with anyone board member without our approval.
- In case, the chairperson needs to be replaced then consent of 2/3rd board members are required and they are also required to jointly pass the resolution copy of which should be sent to us. In such case, it will be compulsory to obtain our approval before replacement.
- In case of "Difference of Opinion [if any]" among the Board members, our decision will be final and binding to everyone. "

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1. General,

2. Ethical Guidelines,

3. Submission of Manuscripts,

4. Manuscript's Category,

5. Structure and Format of Manuscript,

6. After Acceptance.

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28. Make colleagues: Always try to make colleagues. No matter how sharper or intelligent you are, if you make colleagues you can have several ideas, which will be helpful for your research.

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- Write your paper in the form, which is presented in the guidelines using the template.
- Please note the criterion for grading the final paper by peer-reviewers.

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Writing a research paper is not an easy job no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record keeping are the only means to make straightforward the progression.

General style:

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

To make a paper clear

· Adhere to recommended page limits

Mistakes to evade

- Insertion a title at the foot of a page with the subsequent text on the next page
- Separating a table/chart or figure - impound each figure/table to a single page
- Submitting a manuscript with pages out of sequence

In every sections of your document

· Use standard writing style including articles ("a", "the," etc.)

· Keep on paying attention on the research topic of the paper

· Use paragraphs to split each significant point (excluding for the abstract)

· Align the primary line of each section

· Present your points in sound order

· Use present tense to report well accepted

· Use past tense to describe specific results

· Shun familiar wording, don't address the reviewer directly, and don't use slang, slang language, or superlatives

· Shun use of extra pictures - include only those figures essential to presenting results

Title Page:

Choose a revealing title. It should be short. It should not have non-standard acronyms or abbreviations. It should not exceed two printed lines. It should include the name(s) and address (es) of all authors.

Abstract:

The summary should be two hundred words or less. It should briefly and clearly explain the key findings reported in the manuscript--must have precise statistics. It should not have abnormal acronyms or abbreviations. It should be logical in itself. Shun citing references at this point.

An abstract is a brief distinct paragraph summary of finished work or work in development. In a minute or less a reviewer can be taught the foundation behind the study, common approach to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Yet, use comprehensive sentences and do not let go readability for briefness. You can maintain it succinct by phrasing sentences so that they provide more than lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study, with the subsequent elements in any summary. Try to maintain the initial two items to no more than one ruling each.

- Reason of the study - theory, overall issue, purpose
- Fundamental goal
- To the point depiction of the research
- Consequences, including definite statistics - if the consequences are quantitative in nature, account quantitative data; results of any numerical analysis should be reported
- Significant conclusions or questions that track from the research(es)

Approach:

- Single section, and succinct
- As a outline of job done, it is always written in past tense
- A conceptual should situate on its own, and not submit to any other part of the paper such as a form or table
- Center on shortening results - bound background information to a verdict or two, if completely necessary
- What you account in an conceptual must be regular with what you reported in the manuscript
- Exact spelling, clearness of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else

Introduction:

The **Introduction** should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable to comprehend and calculate the purpose of your study without having to submit to other works. The basis for the study should be offered. Give most important references but shun difficult to make a comprehensive appraisal of the topic. In the introduction, describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will have no attention in your result. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here. Following approach can create a valuable beginning:

- Explain the value (significance) of the study
- Shield the model - why did you employ this particular system or method? What is its compensation? You strength remark on its appropriateness from a abstract point of vision as well as point out sensible reasons for using it.
- Present a justification. Status your particular theory (es) or aim(s), and describe the logic that led you to choose them.
- Very for a short time explain the tentative propose and how it skilled the declared objectives.

Approach:

- Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done.
- Sort out your thoughts; manufacture one key point with every section. If you make the four points listed above, you will need a least of four paragraphs.

- Present surroundings information only as desirable in order hold up a situation. The reviewer does not desire to read the whole thing you know about a topic.
- Shape the theory/purpose specifically - do not take a broad view.
- As always, give awareness to spelling, simplicity and correctness of sentences and phrases.

Procedures (Methods and Materials):

This part is supposed to be the easiest to carve if you have good skills. A sound written Procedures segment allows a capable scientist to replacement your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt for the least amount of information that would permit another capable scientist to spare your outcome but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section. When a technique is used that has been well described in another object, mention the specific item describing a way but draw the basic principle while stating the situation. The purpose is to text all particular resources and broad procedures, so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step by step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

- Explain materials individually only if the study is so complex that it saves liberty this way.
- Embrace particular materials, and any tools or provisions that are not frequently found in laboratories.
- Do not take in frequently found.
- If use of a definite type of tools.
- Materials may be reported in a part section or else they may be recognized along with your measures.

Methods:

- Report the method (not particulars of each process that engaged the same methodology)
- Describe the method entirely
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures
- Simplify - details how procedures were completed not how they were exclusively performed on a particular day.
- If well known procedures were used, account the procedure by name, possibly with reference, and that's all.

Approach:

- It is embarrassed or not possible to use vigorous voice when documenting methods with no using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result when script up the methods most authors use third person passive voice.
- Use standard style in this and in every other part of the paper - avoid familiar lists, and use full sentences.

What to keep away from

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings - save it for the argument.
- Leave out information that is immaterial to a third party.

Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part a entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Carry on to be to the point, by means of statistics and tables, if suitable, to present consequences most efficiently.You must obviously differentiate material that would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matter should not be submitted at all except requested by the instructor.

Content

- Sum up your conclusion in text and demonstrate them, if suitable, with figures and tables.
- In manuscript, explain each of your consequences, point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation an exacting study.
- Explain results of control experiments and comprise remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or in manuscript form.

What to stay away from

- Do not discuss or infer your outcome, report surroundings information, or try to explain anything.
- Not at all, take in raw data or intermediate calculations in a research manuscript.
- Do not present the similar data more than once.
- Manuscript should complement any figures or tables, not duplicate the identical information.
- Never confuse figures with tables - there is a difference.

Approach

- As forever, use past tense when you submit to your results, and put the whole thing in a reasonable order.
- Put figures and tables, appropriately numbered, in order at the end of the report
- If you desire, you may place your figures and tables properly within the text of your results part.

Figures and tables

- If you put figures and tables at the end of the details, make certain that they are visibly distinguished from any attach appendix materials, such as raw facts
- Despite of position, each figure must be numbered one after the other and complete with subtitle
- In spite of position, each table must be titled, numbered one after the other and complete with heading
- All figure and table must be adequately complete that it could situate on its own, divide from text

Discussion:

The Discussion is expected the trickiest segment to write and describe. A lot of papers submitted for journal are discarded based on problems with the Discussion. There is no head of state for how long a argument should be. Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implication of the study. The purpose here is to offer an understanding of your results and hold up for all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of result should be visibly described. Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved with prospect, and let it drop at that.

- Make a decision if each premise is supported, discarded, or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."
- Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work
- You may propose future guidelines, such as how the experiment might be personalized to accomplish a new idea.
- Give details all of your remarks as much as possible, focus on mechanisms.
- Make a decision if the tentative design sufficiently addressed the theory, and whether or not it was correctly restricted.
- Try to present substitute explanations if sensible alternatives be present.
- One research will not counter an overall question, so maintain the large picture in mind, where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

- When you refer to information, differentiate data generated by your own studies from available information
- Submit to work done by specific persons (including you) in past tense.
- Submit to generally acknowledged facts and main beliefs in present tense.

Please carefully note down following rules and regulation before submitting your Research Paper to Global Journals Inc. (US):

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	A-B	**C-D**	**E-F**
Abstract	Clear and concise with appropriate content, Correct format. 200 words or below	Unclear summary and no specific data, Incorrect form Above 200 words	No specific data with ambiguous information Above 250 words
Introduction	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

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