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Role of computed tomography in thyroid nodule evaluation,our experience in a tertiary care hospital

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Abstract:
Background*:Thyroid nodules are becoming more important in clinical setting and the prevalence of thyroid carcinoma is on the rise. The main challenge to the clinician is to decide which one requires evaluation and intervention. Clinical examination although accurate in most cases, is inadequate in some areas, especially in staging of thyroid malignancies and in detecting the multinodularity and in differentiating malignant from benign thyroid nodules. Computed tomography (CT) of neck has only a supplementary role in head and neck surgery. The preoperative use of CT neck is not routinely recommended according to American Thyroid Association guidelines. However, Ultrasound of neck is often operator dependent and sometimes difficult to obtain adequate images of the entire neck. On contrast CT scan is non operator dependent and is frequently used for detecting cervical lymph node metastasis.*
Materials and Methods*: In the present study,50 patients who presented with thyroid swelling were studied over a period of 1 year at R.G.Kar Medical college and hospital , a tertiary care hospital of Kolkata. All the patients included in the present study were clinically examined by physicians and were subsequently referred to our ENT department, from where patients were referred to Radiology department for imaging studies by CT Scan. : The aim of our study is to compare and correlate betweencomputed tomography and Histopathology of resected specimen.*
Results*: CT scan has an adjuvant role in evaluation of thyroid masses. CT scan is not sensitive in detecting intrathyroidallesions.CT is very specific in diagnosing benign and malignant thyroid masses.CT scan is sensitive in detecting locoregionallymphadenopathy and to visualize the extent of disease.*
Conclusion:*When CT is combined with Ultrasound results, Surgeon gets additional preoperative picture of the thyroid mass.*
Key Word*: CT,thyroid,lymphadenopathy*

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I. Introduction

Thyroid nodules are becoming more important in clinical setting and the prevalence of thyroid carcinoma is on the rise. The main challenge to the clinician is to decide which one requires evaluation and intervention. Clinical examination although accurate in most cases, is inadequate in some areas, especially in staging of thyroid malignancies and in detecting the multinodularity and in differentiating malignant from benign thyroid nodules. Diseases of thyroid gland, especially goitre due to deficiency of Iodine is prevalent in India. India has the world's biggest Goitre belt in the Sub-Himalayan region with nearly 55 million cases are estimated to be suffering from endemic Goitre. Currently, not less than 140 million people are estimated to be living in Goitre endemic regions of the country[1,] Half of the people above 50years or over with clinically normal thyroid glands and normal thyroid function may have thyroid nodules. The annual rise in incidence of thyroid carcinoma is 2.4%[2]. The clinical importance of thyroid nodules is to exclude thyroid carcinoma, which occurs in 5-15% of the patients. Thyroid cancer accounts for only 0.4% of all cancer deaths.The most common way for thyroid cancer to present is as a solitary thyroid nodule and the fundamental and crucial question facing the physician or surgeon is how to detect the 10 percent of solitary nodules with cancer so that safe and effective surgery can be offered to those who require it Fine needle aspiration cytology is now the cornerstone of investigation. Although thyroid lesions can be detected clinically, we often need to investigate for obtaining further details.

Computed tomography (CT) of neck has only a supplementary role in head and neck surgery. The preoperative use of CT neck is not routinely recommended according to American Thyroid Association

guidelines. However, Ultrasound of neck is often operator dependent and sometimes difficult to obtain adequate images of the entire neck. On contrast CT scan is non operator dependent and is frequently used for detecting cervical lymph node metastasis.

AIMS AND OBJECTIVES

1. To correlate clinical diagnosis and Computed tomography in evaluation of thyroid mass.
2. To compare radiological tools Computed tomography with histopathology in thyroid mass.

II. Material And Methods

This prospective comparative study was carried out on patients of Department of otorhinolaryngology atR.G.Kar Medical college and hospital,Kolkata,west Bengal from December 2019 to December 2020. A total 50 adult subjects (both male and females) of aged ≥ 18, years were for in this study.

Study Design: Prospective open label observational study

Study Location: This was a tertiary care teaching hospital based study done inDepartment of otorhinolaryngology atR.G.Kar Medical college and hospital,Kolkata,west Bengal.

Study Duration: December 2019 to December 2020.

Sample size: 50 patients.

Sample size calculation: 50 cases [Cochran Formula: n = $\frac{Z^2PQN}{e^2(N-1)+Z^2PQ}$]

where n = number of subjects ,
P = population proportion ,
e = level of precision (5% i.e 0.05),
Q = 1-P
Using Z = 1.96, z score for 5% significance level
Using P as 12% i.e .0.12(in accordance with previous studies)
Using N= Estimated patients available during the study period (past hospital records)=70

Inclusion criteria:

1. Patients willing to take part and give written informed consent.
2. Patients with complaint of thyroid swelling, attending department of ENT between 9-80 years age group, during the study period and willing to undergo surgery for the same.

Exclusion criteria:

1. Patients not willing to take part in the study.
2. Patients lost to follow up during the study period.
3. Patients unfit for surgery and patients not willing to undergo surgery at this hospital are excluded.

Procedure methodology

After written informed consent was obtained, All patients were examined clinically after taking a detailed history. Computed Tomography was done by using GE single slice CT scanner. In Computed Tomography, thyroid masses was evaluated for size, number of nodules, enhancement, compression or displacement of adjacent structures, retrosternal extension, lymphadenopathy and to differentiate between benign and malignant thyroid lesions. Then, all the patients were subjected to surgery and histopathological examination (HPE) of the specimen obtained. All the subjects will be followed up as per the disease.

Statistical analysis

Statistical analysis will be performed using a computer Statistical Package for Social Sciences (SPSS) program Version 16.0. Results will be presented as frequency and percentage.

The sensitivity, specificity, positive predictive value, negative predictive value and accuracy of computed tomography in evaluation of thyroid masses would be evaluated using categorical tables. Statistical formula used in this study

Screening test Results	Diagnosis		Total
	Diseased	Not Diseased	
Positive	True positive (a)	False Positive(b)	(a+b)
Negative	False Negative (c)	False Positive(d)	(c+d)
Total	(a+c)	(b+d)	(a+b+c+d)

$$\text{Sensitivity (True positive)} = \frac{\text{True Positive (a)}}{\text{True positive (a) + False Negative (c)}} \times 100$$

$$\text{Specificity (True Negative)} = \frac{\text{True Negative (d)}}{\text{False positive (b) + True Negative (d)}} \times 100$$

$$\text{Positive Predictive value} = \frac{\text{True Positive (a)}}{\text{True positive (a) + False Positive (b)}} \times 100$$

$$\text{Negative Predictive value} = \frac{\text{True Negative (d)}}{\text{True Negative (d) + False Negative (c)}} \times 100$$

$$\text{Accuracy} = \frac{\text{TP (a) + TN (d)}}{\text{TP (a) + TN (d) + FP (b) +FN (c)}} \times 100$$

III. Result

Table 1
Age Incidence

Age Group	No of Patients	Percentage distribution of Age group
<10	0	0
10-19	1	2
20-29	4	8
30-39	5	10
40-49	30	60
50-59	6	12
60-69	1	2
70-79	3	6
Total	50	100

Table 2
Sex Incidence

Gender	No of Patients	Percentage
Male	5	10
Female	45	90

Table 3
Incidence of malignant mass according to CT diagnosis

Malignant mass	No of Patients	Percentage
Benign	40	80
Malignant	10	20

Table 4
Single/Multiple/diffuse Nodules

Single/Multiple Nodules	No of Patients	Percentage
Single	31	62
Multiple	12	24
Diffuse	7	14

Table 5
Compression/Displacement of Trachea and major vessels

Compression/Displacement	No of Patients	Percentage
Present	10	20%
Absent	40	80%

Figure 1
Retrosternal extension

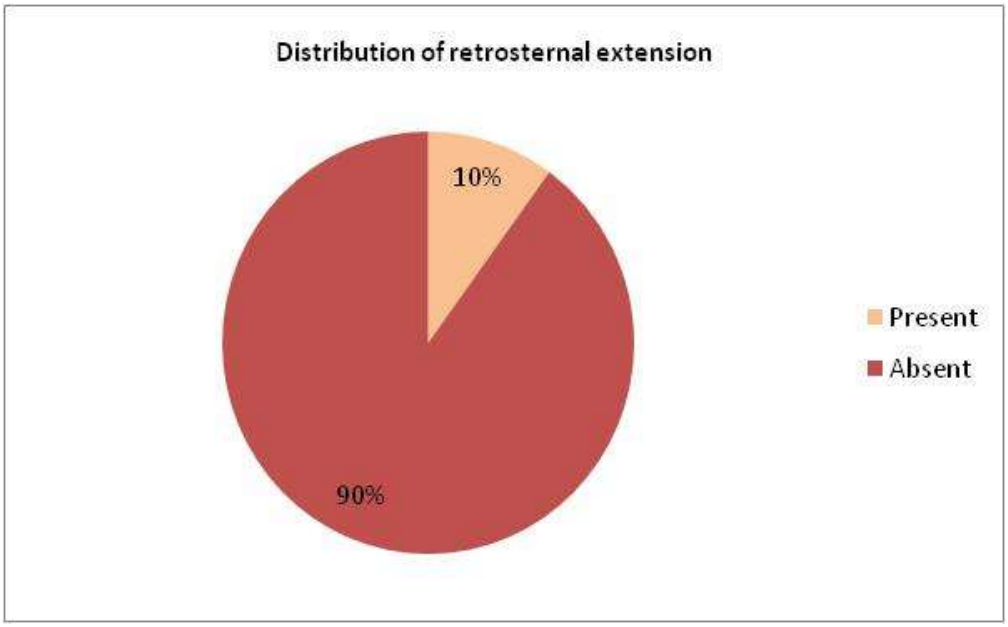
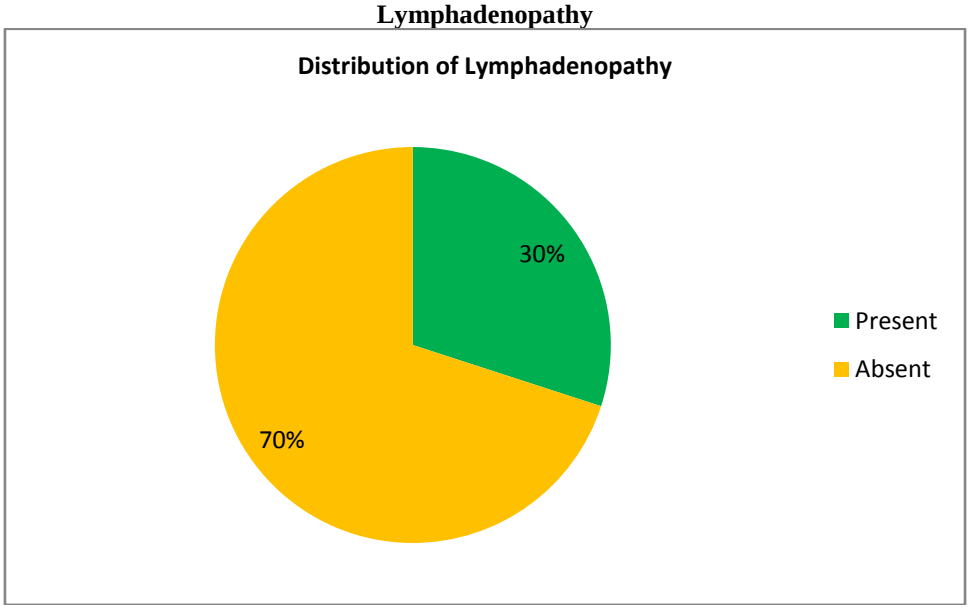


Figure 2
Lymphadenopathy



Histopathology

Table 6
Pathological diagnosis of thyroid lesions

Pathological Diagnosis	No of Patients	Percentage distribution of Radiological Diagnosis
Nodular goitre	35	70
Medullary carcinoma thyroid	1	2
Thyroiditis	1	2
Hyalinizingtrabecular adenoma	1	2
Papillary carcinoma thyroid	12	24

Table 7

		Histopathology		Total
		Malignant	Benign	
CT	Malignant	10	0	10
	Benign	3	37	40
		13	37	50

Statistics For CT	**Value**
Sensitivity	76.92%
Specificity	98.00%
Disease prevalence	26.00% (*)
Positive Predictive Value	100.00% (*)
Negative Predictive Value	92.50% (*)

IV.Discussion

In the present study, majority of the patients were in 40-49 years age-group; the youngest being 19 years old and the eldest being 71 years old. The mean age was 44 years. In similar study by AnupKureleet al[6]the most common age group was 31-40 years within a range of 8-78 years.

In the similar study by I .S. Nam Goong et al[10],the age-group was 26-75 years with mean age of 51 years .

A study by Eisuke Koike et al[3] has a range of 15-82 years with mean age of 52 years. A study by Sanjay K Shetty et al[9] has a range of 29-94 years with mean age of 64.5 years.

In the present study, 90% were female patients and 10% were male patients.Sofemales are more commonly affected than males .The male to female ratio was 1:9.

In the study by I .S. Nam Goong et al[5], 78% patients were females & 22% males. In the study by AnupKureleet al[6] sex ratio was 1:4.7.

In a study by Eisuke Koike et al[3]. 89% patients were females & 11% males.

Majority of the lesions were benign which correlate with the study done by KamaljitKauret al[4]. Out of the 10 malignant lesion diagnosed 7 lesions seen in patients more than 50 years of age, While only one malignant lesion was seen in patients below 30 years in our study. So rate of malignancy is higher in elderly patients.

Out of 10 malignancy 3 were seen in males and 7 were seen in females. So the percentage of malignancy in male is 3 out of 13(23%) and in females is 7 out of 37(18.9%).

The commonest pathological diagnosis in the present study was Goitre 68% and the next being malignancy 20%.

This correlates with the study of KamaljitKaur et al[4] which also had 68% cases of Goitre and 18% cases of malignancy.

Yoon Jung Choi et al[7](2015)reviewed data from 176 with surgically confirmed papillary carcinoma of thyroid who underwent preoperative USG neck ,CT scan & CT guided USG. Neck CT showed 23.5%

sensitivity & 55.7% diagnostic accuracy in detecting central LMN & 71.4% sensitivity with 90.9% diagnostic accuracy in detecting lateral neck LMN.

Jeong Hyun Lee et al[8] (2008)studied 37 consecutive patients who subsequently underwent total thyroidectomy & neck dissection for thyroid cancer. The sensitivity, specificity & diagnostic accuracy were 77%,70%,74% for CT respectively with a significant difference in the sensitivities(p=0.002).

Haberal I et al[11] (2004)conducted a prospective study in a tertiary referral hospital. During September 1996 and April 1999, clinical investigation, USG, and CT were performed preoperatively on 48 patients who underwent neck dissection for primary head and neck malignancy. The presence of metastatic lymph nodes in pathologic specimens was compared with the findings of palpation, CT, and USG. Respective values for CT for sensitivity, specificity, negative predictive value, positive predictive value, and accuracy were 81%, 96%, 85%, 90%, and 87%.

CT characteristics: a single feature does not conclude that the thyroid mass is benign or malignant. Out of 5 patients with retrosternal extension, 4 of them were thyroid carcinomas. Out of 15 patients with lymphadenopathy, 10 were malignant thyroid masses.

V. Conclusion

CT scan has an adjuvant role in evaluation of thyroid masses. CT scan is not sensitive in detecting intrathyroidallesions.CT is very specific in diagnosing benign and malignant thyroid masses.CT scan is sensitive in detecting locoregionallymphadenopathy and to visualize the extent of disease.When CT is combined with Ultrasound results, Surgeon gets additional preoperative picture of the thyroid mass. CT scan has an adjuvant role in evaluation of thyroid masses.

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Statistical analysis

Data was analyzed using SPSS version 20 (SPSS Inc., Chicago, IL). Student's *t*-test was used to ascertain the significance of differences between mean values of two continuous variables and confirmed by nonparametric Mann-Whitney test. In addition, paired *t*-test was used to determine the difference between baseline and 2 years after regarding biochemistry parameters, and this was confirmed by the Wilcoxon test which wasa nonparametric test that compares two paired groups. Chi-square and Fisher exact tests were performed to test for differences in proportions of categorical variables between two or more groups. The level $P < 0.05$ was considered as the cutoff value or significance.

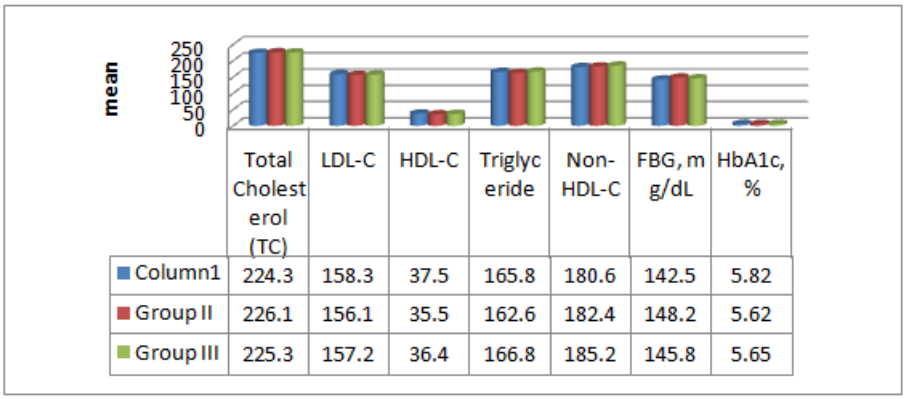
VI. Result

After 6 weeks of follow upmit was found that LDL-C ,went down by -32.81%on regular dose of Atorvastatin 40 mg,-37.28% on Rosuvastatin 20 mg daily and -37.53% on Rosuvastatin 20 mg alternate day.
The total Cholestrol level reduced by -14.71%,17.35%,-11.63%,respectively.
Trigyceride level reduced by -14.71%,17.3%,11.^3%, respectively.
Non HDL-C went down by -37.32%,29.715% and -29.71% respectively.
HDL-C improved by +3.46%,+8.17%and 8.17%,respectively.

Table no 1 Shows metabolic parameters of patients of the three groups before treatment. Total cholesterol (TC), 224.3 ±30.8 mg/dl, 226.1 ±35.4&225.3 ±40.7 mg/dl, LDL-C, 158.3 ±22.6 mg/dl, 156.1 ±27.8&157.2 ±26.7 mg/dl, HDL-C, 37.5 ±2.70 mg/dl, 35.5 ±2.21&36.4 ±1.90 mg/dl, Triglyceride165.8 ±30.8 mg/dl, 162.6 ±28.2&166.8 ±35.7mg/dl, Non-HDL-C 180.6 ±31.2 mg/dl, 182.4 ±29.2 & 185.2 ±32.4 mg/dl, , FBG, 142.5 ±25.7 mg/dl, 148.2 ±26.9 & 145.8 ±27. mg/dl4, HbA1c, %, 5.82 ±0.2, 5.62±0.4 & 5.65 ±0.3 respectively of patients of the three groups. The difference in the values of all parameters in respect of three groups was not statistically significant (p>0.05)

Table no 1 Shows metabolic parameters of patients of the three groups before treatment.

	Atorvastatin 40 mg	Rosuvastatin 20mg	Rosuvastatin 20 mg alternate day	P value (I to II)	P value (I to III)	P value (II to III)
Lipids, mg/dL						
Total Cholesterol (TC)	224.3±30.8	226.1±35.4	225.3±40.7	0.7017	0.8449	0.8449
LDL-C	158.3±22.6	156.1±27.8	157.2±26.7	0.5399	0.7535	0.7757
HDL-C	37.5±8.70	35.5±9.21	36.4±7.90	0.357	0.487	0.389
Triglyceride	165.8±30.8	162.6±28.2	166.8±35.7	0.4444	0.8323	0.3570
Non-HDL-C	180.6±31.2	182.4±29.2	185.2±32.4	0.6740	0.3077	0.5216
Glucose and HbA1C						
FBG, mg/dL	142.5±25.7	148.2±26.9	145.8±27.4	0.1271	0.3808	0.5327
HbA1c, %	5.82±0.2	5.62±0.4	5.65±0.3	0.265	0.357	0.647



Follow up after 6 weeks

Table no 2:Records the percent change in lipids,(mg/dL) on a regular dose of atorvastatin40 mg.for 6weeks. (TC)level reduced by(-32.81%), low-density lipoproteins cholesterol(LDL-C)went down by(-46.99%),triglycerides reduced by by(-14.71%), non-HDL-C went down by(-37.32%).While there had been a reduction in the undesirable Lipids, as above, due to the above medication ,there was a positive upwards change in the desirable lipids like high-density lipoprotein cholesterol (HDL-C) which improved by(+3.46%).Further, Fasting blood glucose (FBG) mg/dL level were reduced by (-36.17%).and HbA1c, % hemoglobin A1C test which measures blood sugar control over the preceding three months had also gone down by(-1.89%). The desirable alterations in respect of all the above parameters after 6 weeks of medication which are attributable to the above medication, were highly statistically significant, P<0.001 except HbA1c .

Table no2 Records the Percent Change in Lipids profile after treatment given.

	Atorvastatin 40 mg (before)	Atorvastatin 40 mg (After)	Percentage Change	P value
Lipids, mg/dL				
Total Cholesterol (TC)	224.3±30.8	150.7±22.2	-32.81%	<0.001
LDL-C	158.3±22.6	83.9±15.1	-46.99%	<0.001
HDL-C	37.5±2.70	38.8±3.5	+3.46%	0.003
Triglyceride	165.8±30.8	141.4±22.6	-14.71%	<0.001
Non-HDL-C	180.6±31.2	113.2±18.1	-37.32%	<0.001
Glucose and HbA1C				
FBG, mg/dL	142.5±25.7	90.95±7.9	-36.17%	<0.001
HbA1c, %	5.82±0.2	5.71±0.3	-1.89%	0.198

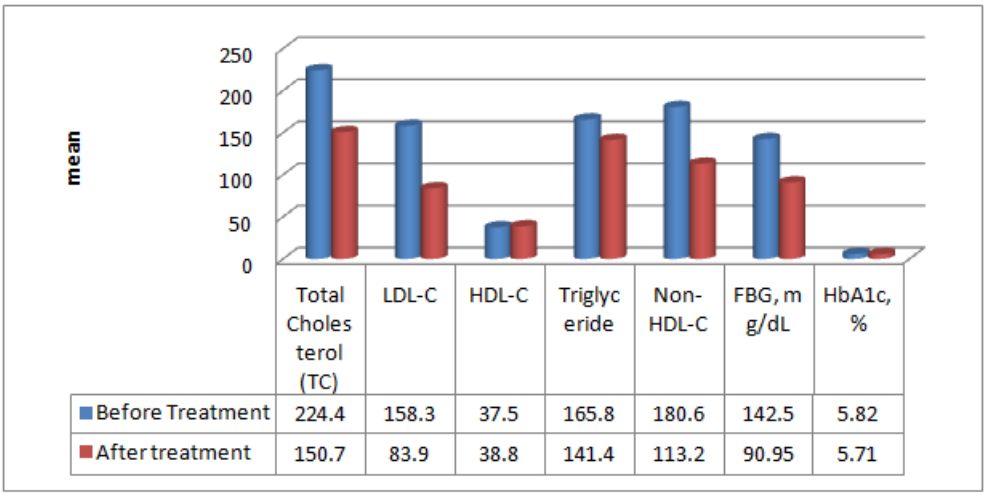


Table no3: Shows Percent Change in Lipids,(mg/dL) on a regular dose of Rosuvastatin 20mg for 6weeks. Total Cholesterol (TC)level reduced by(-26.49%), Low-density lipoproteins cholesterol(LDL-C) went down by (-37.28%), Triglyceride reduced to(-17.3%), Non-HDL-C went down by(-29.71%),after 6 weeks of medication. While there had been a reduction in the undesirable Lipids due to the above medication ,there was a positive upwards change in the desirable Lipids like high-density lipoprotein cholesterol (HDL-C) which improved by (+8.17%), Further, Fasting blood glucose, FBG, mg/dL level were reduced by (-37.95%). and HbA1c, % hemoglobin A1C test which measures blood sugar control over the preceding three months had also gone down by(-11.00%). The desirable alterations in respect of all the above parameters which were attributable to the above medication, were statistically significant, P<0.001---0.033.

Table no3: Shows Percent Change in Lipids,(mg/dL) on a regular dose of Rosuvastatin 20mg for 6 weeks**.**

	Rosuvastatin 20mg (before)	Rosuvastatin 20mg (After)	Percentage Change	P value
Lipids, mg/dL				
Total Cholesterol (TC)	226.1±35.4	166.2±25.7	-26.49%	<0.001
LDL-C	156.1±27.8	97.9±14.7	-37.28%	<0.001
HDL-C	35.5±2.21	38.4±3.6	+8.17%	<0.001
Triglyceride	164.6±28.2	136.2±23.4	-17.3%	<0.001
Non-HDL-C	182.4±29.2	128.2±20.5	-29.71%	<0.001
Glucose and HbA1C				
FBG, mg/dL	148.2±26.9	91.95±8.8	-37.95%	<0.001
HbA1c, %	5.62±0.4	5.5±0.2	-2.13%	0.187

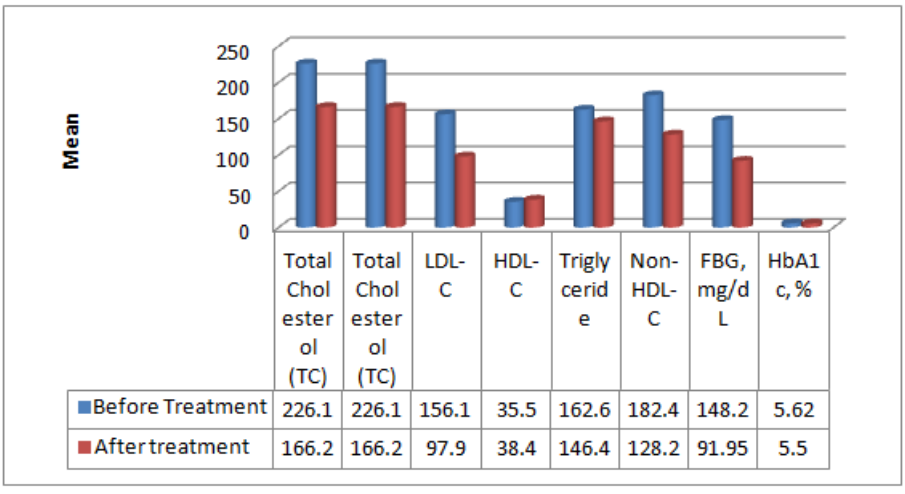


Table no4 Shows Percent Change in Lipids,(mg/dL) on a dose of Rosuvastatin 20mg on alternate Days for 6weeks. Total Cholesterol (TC)level reduced by(-26.36%), Low-density lipoproteins cholesterol (LDL-C) went down by (-37.53%), Triglyceride reduced by by(-11.63%), Non-HDL-C went down by(-29.71%),. While there

had been a reduction in the undesirable Lipids due to the above medication ,there was a positive upwards change in the desirable Lipids like high-density lipoprotein cholesterol (HDL-C) which improved by(+8.17%), Further, Fasting blood glucose, FBG, mg/dL level were reduced by (-36.65%). and HbA1c, % hemoglobin A1C test which measures blood sugar control over the preceding three months had also gone down by(+4.07%). The desirable changes in respect of all the above parameters attributable to the above medication, were statistically highly significant, P<0.001---0.033 except HbA1c.

	Rosuvastatin 20 mg alternate day (before)	Rosuvastatin 20 mg alternate day (After)	Percentage Change	P value
Lipids, mg/dL				
Total Cholesterol (TC)	225.3±40.7	165.9±23.1	-26.36%	<0.001
LDL-C	157.2±26.7	98.2±16.3	-37.53%	<0.001
HDL-C	36.4±1.90	38.5±2.9	+5.76%	< 0.001
Triglyceride	166.8±35.7	140.4±21.9	-15.83%	<0.001
Non-HDL-C	185.2±32.4	127.2±19.9	-31.31%	<0.001
Glucose and HbA1C				
FBG, mg/dL	145.8±27.4	92.35±9.6	-36.65%	<0.001
HbA1c, %	5.65±0.3	5.66±0.4	+0.17%	0.287

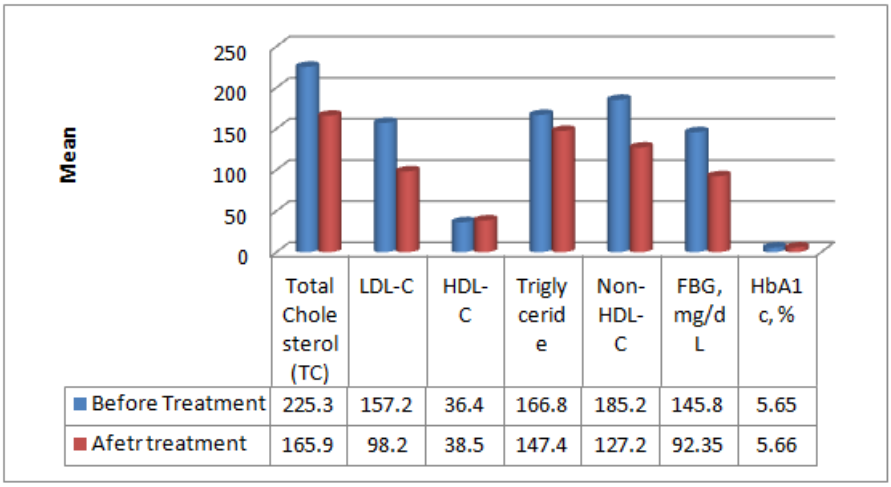
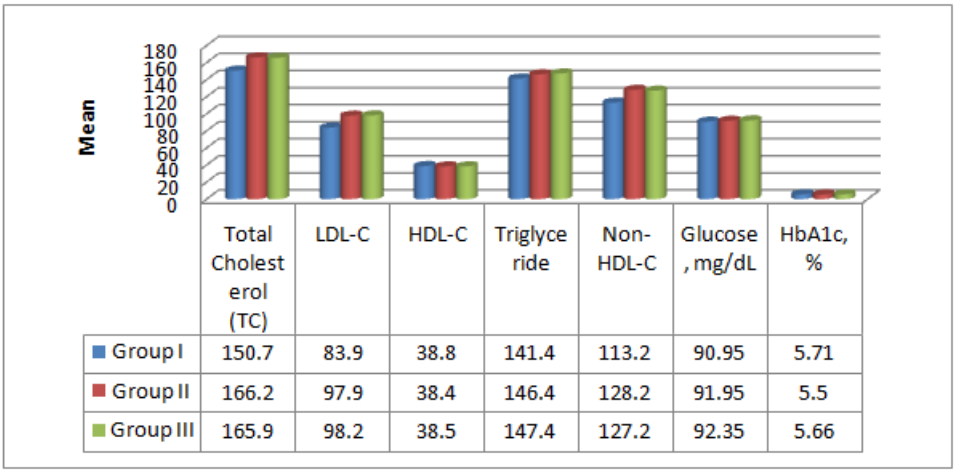


Table no 5 Shows metabolic parameters of patients of each of the three groups after 6 weeks of treatment. Metabolic parameters of patients of the three groups after 6 weeks of medication reveal that not only maximum quantities of harmful lipids like total cholesterol, LDL-C, Triglyceride, Non-HDL-C, Glucose, mg/dL ,have gone down, there was an increase in the useful lipids like HDL-C and in the patients treated with a regular dose of Atorvastatin 40 mg. In that group of patients the HbA1c, % level was also well within the normal range of4% to 5.6%. The variation in the quantities of Total Cholesterol , LDL-CandHbA1c, % among the patients of the three groups was statistically significant as P<0.001.

Table no 5 : Shows metabolic parameters of patients of each of the three groups after 6 weeks of treatment.

	Atorvastatin 40 mg	Rosuvastatin 20mg	Rosuvastatin 20 mg alternate day	P value (I to II)	P value (I to III)	P value (II to III)
Lipids, mg/dL						
Total Cholesterol	150.7±22.2	166.2±25.7	165.9±23.1	<0.001	<0.001	0.9309
LDL-C	83.9±15.1	97.9±14.7	98.2±16.3	< 0.001	< 0.001	0.8914
HDL-C	38.8±3.5	38.4±3.6	38.5±2.9	0.4266	0.5100	0.8290
Triglyceride	141.4±22.6	146.4±23.4	147.4±21.9	0.1259	0.0580	0.7554
Non-HDL-C	113.2±18.1	128.2±20.5	127.2±19.9	< 0.001	< 0.001	0.7267
Glucose and HbA1C						
Glucose, mg/dL	90.95±7.9	91.95±8.8	92.35±9.6	0.398	0.261	0.759
HbA1c, %	5.71±0.3	5.5±0.2	5.66±0.4	0.013	0.010	0.056

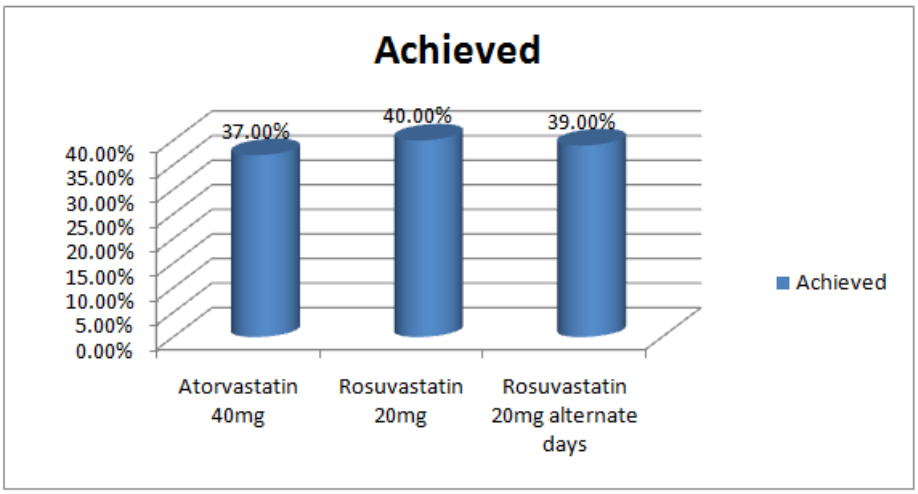


	Total Cholesterol (TC)	LDL-C	HDL-C	Triglyceride	Non-HDL-C	Glucose, mg/dL	HbA1c, %
Group I	150.7	83.9	38.8	141.4	113.2	90.95	5.71
Group II	166.2	97.9	38.4	146.4	128.2	91.95	5.5
Group III	165.9	98.2	38.5	147.4	127.2	92.35	5.66

Table no 6 *National Cholesterol Education Program* NCEP ATP III goal. Figures show that while NCEP ATP III goal was achieved by40 (40%) patient treated with a regular dose of Rosuvastatin 20mg, 39 (39%)patient could achieve the goal with an alternate dose of Rosuvastatin 20mg . As for treatment with Atorvastatin 40mgwas concerned only 37 (37%) patient achieved the goal as stipulated by *National Cholesterol Education Program* NCEP ATP III goal.

Table no 6 : National Cholesterol Education ProgramNCEP ATP III goal**.**

Number of patients (%) achieving NCEP ATP III goal		
Statin therapy	Achieved (%)	Total
Atorvastatin 40mg	37 (37)	100
Rosuvastatin 20mg	40 (40)	100
Rosuvastatin 20mg alternate days	39 (39)	100
Total	116(38.66)	300



VII. Discussion

Dyslipidemia in patients with diabetes plays an important role in development of atherogenesis. The standarded of treatment for dyslipidemia have been statins.For the treatment of dyslipidemia the most commonly used statins are areatorvastatin and rosuvastatin.

The four major statin beneficiary groups have already been defined by NCEP 2013 report.

There is a wealth of evidence suggesting that lowering low density lipoprotein cholesterol (LDL-C) reduces the risk of cardiovascular disease (CVD). Both European and US guidelines for CVD prevention recommend the use statins as first-line therapy for dyslipidemia and specify target LDL-C levels. Previously, a National Cholesterol Education Program (NCEP) report had proposed to lower target levels to even more aggressive LDL-C goals for very high-risk patients.

Despite the proven benefits of LDL-C reduction ,lipid managenent is suboptimal and many patients fail to achieve recommended LDL-C goals[11,12]. Themost likely reasons for this are the use of agents with poor efficacy for LDL-C lowering and suboptimal dose titration.

Such aggressive LDL-C goals,however are harder to achieve. The most effective statin at the lowest dose would represent a simple, effective treatment strategy, enabling more patients to achieve goals without the need for dose titration.

Rosuvastatin, at a dose of 20 mg, has demonstrated high efficacy for LDL-C lowering, enabling patients with hypercholesterolemia to achieve their lipid goals[10,11].

Currently no Indian study is available for treating diabetic patients with dyslipidemia or dyslipidemia alone with statin on alternate day and no previous study has documented the efficacy,safety and cost effectiveness of various statins prescribed to diabetic patients. Thus the present study aimed to build on this growing awareness of atherosclerosis-specific care of diabetes patients, by examining efficacy and safety of the two most commonly prescribed statins in India.

The present study was an open label prospective comparative study done in Department of General Medicine, at Dr. Ram ManoharLohia Combined Hospital a tertiary care teaching hospital,Lucknow, Uttar Pradesh in the time interval of November 2014 to November 2015..

The study,shows that rosuvastatin (20mg daily and 20 mg on alternarnate days) was found to be the most effective statin at reducing LDL-C when compared with atorvastatin (40 mg) daily. In other words, rosuvastatin at its lowest dose in this study (20 mg) on alternate days was more effective at reducing LDL-C levels than atorvastatin at their higher dose (40 mg) daily. Our results are consistent with STELLAR trial which is one of the major open-label, randomized, and multicenter trials to compare rosuvastatin (10, 20, 40, or 80 mg) with atorvastatin (10, 20, 40, or 80 mg), pravastatin (10, 20, or 40 mg), and simvastatin (10, 20, 40, or 80 mg) across dose ranges for reduction of LDL-C[13]. The results of the STELLAR trial revealed that rosuvastatin was consistently, across all doses, the most effective at reducing LDL-C levels in comparison to all of the other statins.

Brunzell JD et al reported the lowering of triglycerides is another important goal in reducing CVD risk among diabetic patients.[5] In the present study, the greatest reduction in triglycerides was (−17.3%, $P < 0.01$) and was achieved by patients taking rosuvastatin (20 mg daily). This was the case, even in comparison with rosuvastatin 20 mg on alternate days and to higher doses of atorvastatin (40 mg). However, it is important to note that rosuvastatin (20 mg on alternate day) and atorvastatin (40 mg) both achieved the second highest reduction in triglycerides (−15.83%, $P < 0.05$, and −14.71%, $P<0.05$), respectively. These findings are similar to the majority of studies in the literature, which have shown a slightly higher reduction in triglycerides in patients taking rosuvastatin in comparison to atorvastatin as reported by Clearfield MB et al.[14]. It thus appears that, reduction in triglyceride levels is equal with rozuvastatin and atorvastatin in relation to this factor (triglycerides),and that both rosuvastatin and atorvastatin are effective in reducing it.

Raising HDL-C levels is another major factor known to reduce CVD risk. In the present study, all of the statins were found to increase HDL-C levels as has been shown in previous studies. Rosuvastatin (20 mg daily) lead to maximal increase (+8.17%).

VIII. Conclusion

Rosuvastatin 20 mg on every other regimen had equal effect when compared to daily dose regimen of atorvastatin 40 mg &rosuvastatin 20mg.

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