ORIGINAL ARTICLE

Examine the Benefits and Usefulness of Computed Tomography for Diagnosis Small Pulmonary Nodules by Using Maximum Intensity Projection Images Compare to Volume Rendering

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ABSTRACT

Aim: To determine the accuracy of Computed Tomography for diagnosing small pulmonary nodules by using maximum intensity projection (MIP) images and volume rendering (VR).
Study Design: Observational
Place and Duration: Dept. of Radiology, Sughra Shafi Medical Complex Narowal from 1-7-2018 to 31-12-2018.
Methods: Forty patients whom had pulmonary metastasis of both genders had ages of 20 to 55 years been included. All patients had pulmonary metastasis. All images were examined as count of nodules, expert radiologist interpreted all images. Distributions of pulmonary nodules were recorded according to volume rendering (VR) and maximum intensity projection (MIP) by expertise.
Results: There were 30(80%) male patients while rest 10 (20%) were females. Four (10%) patients were aged between 20 to 30 years, 8(20%) patients had an age between 31 to 40 years while rest 20 70% were ages >40 years. Total 445 nodules were diagnosed by computed tomography on maximum intensity projection images, out of them 356(80%) were observed by volume rendering while rest 89(20%) were not diagnosed. On central 209(46.97%) nodules were diagnosed by maximum intensity projection and on peripheral 236 were diagnosed by using maximum intensity projection (P<0.001).
Conclusion: Maximum intensity projection imaging technique is more beneficial/useful for diagnosing of small pulmonary nodules as compare to volume rendering.
Keywords: Maximum intensity projection (MIP), Volume rendering (VR), Small pulmonary nodules (SPN)

INTRODUCTION

Worldwide**, i**n human beings, lungs are most important organs. Lungs may be affected from many harmful disorders[1]. It is the most common clinical examination to diagnose pulmonary nodules in radiology departments by using computed tomography technique in the evaluation of the incidences with having or not having malignancy of metastasis to the lungs[2]. Appropriately to diagnosed the nodules, Helical computed tomography is an substitute method[3,4]. However, sensitivity resulted only 47 to 69% for these small nodules in clinical examination by using both techniques such as viewing condition and common computed tomography method[5,6].

Lungs carcinoma diagnosing failure is also happen, half of the cancers diagnosed on helical computed tomography (H-CT) in one diagnosing/screening program have been existing in retrospect on a preceding screening evaluation.[7] Multidetector computed tomography (MDCT) enables simultaneous increased z-axis detection and thinner segment collimation in contrast to single row scanner H-CT. Two main factors limit the viewer for the diagnosing of such nodules, substantial quantity of axial images is generated, which results in observer fatigue whilst examination and on each thin slice, normal vessels are imitated by nodules in cross section and particularly in the central lung zones.[8] One of the example of MDCT is MIP images[9]. This technique applies ray projection technique by a mass of pre-defined axial images, the maximum density point met by the ray passing through the stack is pitched on to the ultimate image. In multiple other researches, the detection rate of nodule by using MIP and VR are higher than the traditional transverse section[10,11]. Some other researcher resulted that volume rendering technique is better than the maximum intensity projection method[12].

Current study was also observed the better diagnosing rate of diagnosis small pulmonary nodules by using maximum intensity projection and volume rendering technique.

MATERIALS AND METHODS

This observational study was conducted at Department of Radiology, Sughra Shafi Medical Complex Narowal from 1st July 2018 to 31st December 2018. Forty patients of both genders had ages of 20 to 55 years been included. All patients had pulmonary metastasis. Patients having age >55 years and those whom had other lungs disorder and those who were not interested to participate were excluded. All images were examined as count of nodules, expert radiologist interpreted all images. Distributions of pulmonary nodules were recorded according to volume rendering (VR) and maximum intensity projection (MIP) by expertise. All statistical data was analyzed by SPSS 21. P-Value <0.05 was considered significantly.

RESULTS

There were 30 (80%) male patients and rest 10(20%) were females. Four (10%) patients were aged between 20 to 30 years, 8(20%) patients had an age between 31 to 40 years

while rest 28(70%) were ages >40 years (Table 1). Total 445 nodules were diagnosed by computed tomography on MIP (maximum intensity projection) images, out of them 356(80%) were observed by VR (volume rendering) while rest 89(20%) were not diagnosed. On central 209(46.97%) nodules were diagnosed by MIP, out of them 152(34.16%) were observed by VR and 57(12.81%) were not detected, and on peripheral 236 were diagnosed by using MIP, out of them 213(47.87%) were detected by Volume Rendering and 23(5.17%) were not detected by VR. P-value 0.001 was recorded (Table 2).

Table 1: Demographic information of the patients (n=40)

Variable	No.	%
Gender		
Male	30	80.0
Female	10	20.0
Age (years)		
20-30	4	10.0
31-40	8	20.0
> 40	28	70.0

Table 2: Distribution of SPN via MIP & VR

SPN	MIP	VR
All nodules		
Yes	445 (100%)	356 (80%)
No	-	89 (20%)
Central nodules		
Yes	209 (46.97%)	152 (34.16%)
No	-	57 (12.81%)
Peripheral		
Yes	236 (53.03%)	204 (45.84%)
No	-	23 (5.17%)

P Value=0.001

DISCUSSION

Many of the studies regarding detection of pulmonary nodules by using MIP (maximum intensity projection) and VR (volume rendering) method of computed tomography shows that MIP technique is better than VR but some researcher resulted VR is better than MIP[12]. In this study, we included patients having pulmonary metastasis, 80% were males and 20% were females. These results shows similarity to the other study conducted by Peloscheck[12] in his research out of 20 patients 12 were males, in another research, results of gender rate shows similarity to the our study[13]. We found 4(10%) patients were aged between 20 to 30 years, 8(20%) patients had an age between 31 to 40 years while rest 28(70%) were ages >40 years.

In the present study, we observed total 445 nodules were diagnosed by computed tomography on MIP (maximum intensity projection) images, out of them 356(80%) were observed by VR (volume rendering) while rest 89(20%) were not diagnosed or missed. MIP method is the useful technique for diagnosing SPN (small pulmonary nodules) than the Volume Rendering method. Many of the researches regarding detection of pulmonary nodules resulted that MIP and VR techniques shows better results than the transverse section examination[14,15]. On central 209(46.97%) nodules were diagnosed by MIP, out of them 152(34.16%) were observed by VR and 57(12.81%) were not detected, and on peripheral 236 were diagnosed by using MIP, out of them 213(47.87%) were detected by Volume Rendering and 23(5.17%) were not detected by VR (P<0.001). These results show similarity to the other study in which MIP images shows better results than the VR images[16-18].

CONCLUSION

Maximum intensity projection imaging technique is more beneficial/useful for diagnosing of small pulmonary nodules as compare to volume rendering. Moreover, we should have to do more work so that we could provide better treatment.

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