

Scintimetric Evaluation of the Rheumatoid Arthritis Involvement by Dr. V. Siva's Retention Ratio-(Preliminary Report)

Sivasubramaniyan V and Venkataramaniah K

Doctoral Research Scholar, Department of Physics, Sri Sathya Sai Institute of Higher Medical Sciences, Andhra Pradesh, India

*Corresponding author: Dr. Sivasubramaniyan V, Doctoral Research Scholar, Sri Sathya Sai Institute of Higher Medical Sciences, Prasanthi nilayam, Andhra Pradesh, India, Tel: 090-3002-5158; E-mail: drvsviva@outlook.com

Received date: November 11, 2016; Accepted date: December 27, 2016; Published date: January 20, 2017

Copyright: © 2017 Sivasubramaniyan V, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Abstract

Aim: This study aims to propose the utility of Scintimetric Characterization of the tracer activity uptake in the joints afflicted by Rheumatoid arthritis in the bone scans.

Materials and method: Three out of five patients of confirmed Rheumatoid arthritis who had bone scans for Bone and joint pains showed presence of skeletal hot spots in various joints. They were subjected to the scintimetric evaluation of the skeletal hot spots by Dr. V. Siva's retention ratio by repeating the 24 hr delayed bone scans. The 58 skeletal hotspots seen in various joint spaces were subjected to the calculation of maximum counts in 3 hr and 24 hr bone scans. They were tabulated and 3/24 hr Dr. V. Siva's Retention Ratio was calculated and analysed.

Results: They showed a mean of 5.91 ± 0.35 and standard error of means as 0.3496. The estimated variance was 8.8408 and the estimated standard deviation was 2.9734. For this sample size the estimated variance was 6.6306 and estimated standard deviation was 2.575 by HOJO's modification. This was unavoidable due to very small size of the Sample population.

Conclusion: Thus this study had shown that the scintimetric evaluation of the skeletal hotspots in the Rheumatoid Arthritis Patients showed a definitive benign value. This could provide a firm base line value to assess the response to treatment and progression as well.

Keywords: Rheumatoid arthritis; Skeletal hotspots; Scintimetric evaluation; Dr. V. Siva's retention ratio

Introduction

The utility of Tc99m MDP bone scans in the successful elimination of Rheumatoid Arthritis in 87% of cases and fruitful confirmation in 80% cases in a study of 139 bone scans in Rheumatoid Arthritis is reported by Duncan et al. [1]. Vos et al. has reported the comprehensive utility and role of various scintigraphic techniques in comparison with other radiological imaging methods [2]. Since the nuclear medicine studies lacked specificity quantitative evaluation methods are attempted. In their study of 69 patients with Reflux Sympathetic disorder after stroke the quantitative valuation of Triple Phase Bone Scan is reported to be non-contributory by Zyluk et al. [3]. Park et al. have shown that the combination of individual phases of the Triple Phase Bone Scan can improve the diagnostic accuracy in patients after stroke [4]. The quantitative evaluation of three phases of the Triple phase bone scan findings into Minimal uptake group and Moderate uptake group has been reported to be useful in classifying patients with reference to time course in stroke patients by Park et al. [5]. The utility of Tc99m Human Immuno Globulin (HIG) in the identification of inflammatory process even in the sero-negative Rheumatoid Arthritis patients had been reported by Gerasimou et al. [6]. A simpler regional scintimetric evaluation of the complex regional pain syndrome by calculating the Asymmetry Score in quantitative triple phase bone scans has been reported by Santhosh et al. [7]. A new Temporal Scintimetric Characterization of the skeletal hot spots by Dr.

V. Siva's Retention Ratio has been devised and reported by us [8]. The utility of Dr. V. Siva's Retention Ratio in the non-invasive characterization of skeletal metastasis in correlation with serum PSA levels and in the evaluation of delayed union of skeletal fractures had been documented by us [9,10]. Hence the same principle was selected for application in the Rheumatoid arthritis patients as well.

Materials and Methods

All the five patients referred by the Rheumatologist for bone pain evaluation underwent Triple Phase Bone scan, 3 h Whole body Bone scan after the intravenous injection of 20 to 25 mCi of Tc99m MDP. The Millennium SPECT gamma camera was used for acquiring the images as per the Xeleris Software specifications.

The 24 h delayed static imaging of the hand followed by the 24 h whole body bone scan were acquired in Three out of Five patients who had focal hot spots in their skeletal tissue. The maximum counts at the 58 skeletal hot spots in the 3 h and 24 h images were calculated using region ratio estimation protocol, tabulated and analyzed. Representative image taken for analysis shown in (Figures 1 and 2).

Results

The maximum counts encountered in the skeletal spots of the Rheumatoid patients in the 3 h and 24 h images and the corresponding 4/24 h ratio were depicted in Table 1.

They showed a mean of 5.91 ± 0.35 and standard error of means as 0.3496. The estimated variance was 8.8408 and the estimated standard deviation was 2.9734. For this sample size the estimated variance was 6.6306 and estimated standard deviation was 2.575 by HOJO's modification. This was unavoidable due to very small size of the Sample population.

	3 h	24 h	3/24 h	site	3 h	24 h	3/24 h
RT 5IPJ	519	100	5.1	Frontal	8554	1622	5.2
RT3IPJ	502	91	5.5	RT3IPJ	5846	3630	1.6
RT2IPJ	504	111	4.5	RT5IPJ	6231	3796	1.6
RT1IPJ	504	135	3.7	LT2IPJ	21224	7668	2.7
RT5MPJ	828	237	3.4	L4	34820	4798	7.2
RT4MPJ	1179	267	4.4	RT4IPJ	235112	34964	6.7
RT3MPJ	1615	377	4.2	RT2IPJ	147315	19018	7.7
RT2MPJ	1134	317	3.5	D2	25729	2895	8.8
RT1MPJ	1085	307	3.5	RT3IPJ	47875	4119	11.6
LT4IPJ	427	179	2.3	RT5IPJ	280348	28339	9.8
LT3IPJ	651	212	3	LT3IPJ	159525	16220	9.8
LT2IPJ	465	181	2.5	D2	3777	2610	1.4
LT1IPJ	513	167	3	L4	38067	3320	11
LT5MPJ	465	210	2.2	RTHP	333083	33492	9.9
LT4MPJ	1192	315	3.7	LTHP	198902	16954	11.7
LT3MPJ	1713	366	4.6	D2	25729	2895	8.8
LT2MPJ	1375	325	4.2	L4	47875	4119	11.6
LT1MPJ	1054	301	3.5	RTHP	280348	28339	9.8
RTCMPJ	5699	1282	4.4	LTHP	159525	16220	9.8
RTWJ	6827	1208	5.6	RT.ILIUM	11540	1458	7.91
LTCMPJ	6673	1230	5.4	LT.FOOT	47717	5524	8.63
RTCMPJ	8164	1483	5.5	L5	17308	2681	6.45
Frontal	4852	879	5.5	D10	10980	1566	7.01
Frontal	4299	928	4.63	D11	28649	4119	6.95
Frontal	13039	3027	4.3	L3	30317	3789	8
Frontal	17873	3498	5.1	L4	37496	4883	7.67
Frontal	31367	6610	4.7	L5	32010	4064	7.87
					MEAN		5.91
					STD.DE V		0.35

Table 1: Scintimetric evaluation of Rheumatoid Arthritis skeletal hot spots.

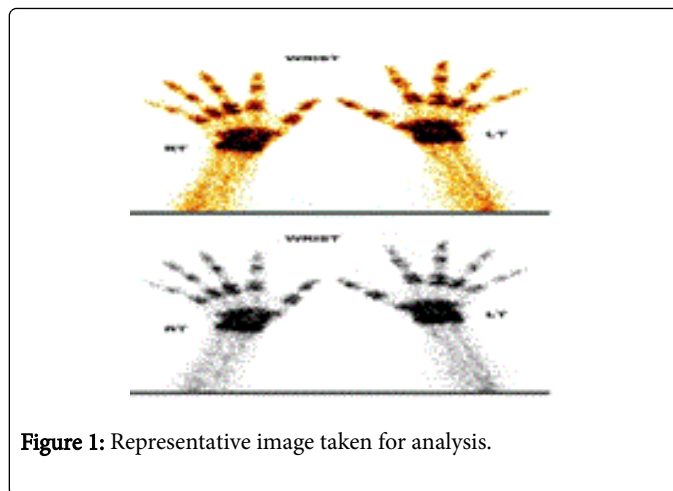


Figure 1: Representative image taken for analysis.

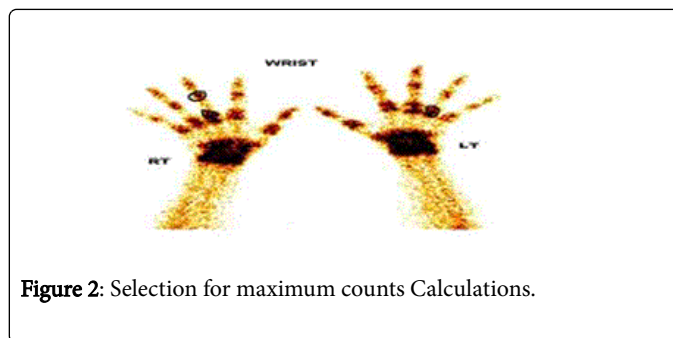


Figure 2: Selection for maximum counts Calculations.

Discussion

All the other quantitative parameters reported were relying on the changes expected out of inflammatory reaction leading to changes in the blood flow and uptake. Both were bound to vary from patient to patient and from one lesion to the other. But the scintimetric characterization of the Skeletal hot spots by Dr. V. Siva's Retention Ratio was found to be successful in variety of clinical conditions resulting in bone changes because of the fact that the metabolic turnover occurring at the hot spot with reference to the time was the basis for interpretation rather than indirect effects.

Conclusion

From the proven utility of the scintimetric characterization of the Skeletal hot spots by Dr.V.Siva's Retention Ratio in Carcinoma prostate and pathological fracture, it can be inferred that the extension of the above application in the joints where active Rheumatoid Arthritis is afflicted is justifiable and appropriate. We hope to extend this to the future cases of Rheumatoid Arthritis patients referred to us to consolidate the findings and present a solid report in the future. Technical collaboration with the institutions actively pursuing Rheumatoid Arthritis will throw much light on this approach.

References

1. Duncan I, Dorai-Raj A, Khoo, Kenneth, Kathleen T, et al. (1999) The Utility of Bone Scans in Rheumatology. Clinical Nuclear Medicine 24: 9-14.
2. Vos K, Van Den Linden E, Pauwels EK J (1999) The clinical role of nuclear medicine in rheumatoid arthritis patients. A comparison with

-
- other diagnostic imaging modalities. *The Quarterly Journal of Nuclear Medicine* 43: 38-45.
3. ZYLUK A, Birkenfeld B (1999) Quantitative evaluation of three-phase bone scintigraphy before and after the treatment of post-traumatic reflex sympathetic dystrophy. *Nuclear Medicine Communications* 20: 327-333.
 4. Seok Guna P, Hyun, Jung Keunb, Lee, Seong J, et al. (2007) Quantitative evaluation of very acute stage of complex regional pain syndrome after stroke using three-phase bone scintigraphy. *Nuclear Medicine Communications* 28: 766-770.
 5. Park SA, Yang CY, Kim CG, Shin YI, Oh GJ, et al. (2009) Patterns of Three-Phase Bone Scintigraphy According to the Time Course of Complex Regional Pain Syndrome Type I After a Stroke or Traumatic Brain Injury *Clinical Nuclear Medicine*. 34: 773-776.
 6. Gerasimou G, Moralidis E, Papanastasiou E, Liaros G, Aggelopoulou T, et al. (2011) Radionuclide imaging with human polyclonal immunoglobulin (99mTc-HIG) and bone scan in patients with rheumatoid arthritis and serum-negative polyarthritis. *Hippokratia* 15: 37-42.
 7. Sampath Santhosh, Bhagwant RM, Sasikumar Arun, AshwaniSood, Anish Bhattacharya, et al. (2013) Usefulness of asymmetry score on quantitative three-phase bone scintigraphy in the evaluation of complex regional pain syndrome, *Indian. Journal of Nuclear Medicine* 28.
 8. Sivasubramaniyan, Venkataramaniah k (2016) Temporal scintimetric characterization of Skeletal Hotspots by Dr.V.SIVA'S Retention Ratio - Information Systems Design and Intelligent. Applications Proceedings of Third International Conference India 1: 297-305.
 9. Sivasubramaniyan V, Venkataramaniah K (2016) Non-invasive Quantitative Characterization of Skeletal Metastasis in Carcinoma Prostate by Tc99m MDP Bone Scans Using Dr. V. Siva's Retention Ratio in Correlation with Serum PSA Levels. *Med Surg Urol*. 5: 164.
 10. Sivasubramaniyan V, Rahul Namdeo , Venkataramaniah k , Vijayasai N (2015) Scintimetric Evaluation in the Assessment of Delayed Union of Skeletal Fractures - *International Journal Of Innovative Research & Development*. 4: 362 -365.