Race/Ethnicity, Vitamin A (retinoic acid) and Associated Serum Markers, and Lesion Volumes in MS Patients

Jason Ledesma, BS[1], Bijal Mehta, MD, MPH[2], Padma Priya Puttagunta, MD[3] and Kristen Berube, BS[3], (1)Neurology, LA BIOMED, Torrance, CA, (2)Neurology, Harbor-UCLA Medical Center, Torrance, CA, (3)Neurology, LA Biomed, Torrance, CA

INTRODUCTION

Recent studies suggest that vitamin A supplementation may hinder the inflammatory response onset by Multiple Sclerosis (MS), as the retinoids derived from vitamin A reduce major T cell populations and interleukin levels that would otherwise initiate the autoimmune events resulting in MS lesions[1,2,4,7]. The effects of vitamin A on MS in patients with corrected vitamin D levels, and furthermore, differences in MS severity as a function of vitamin A levels across different demographic groups, have largely remained unexplored.

OBJECTIVES

The current study examined the effects of vitamin A levels on disease severity and on key MS-related biomarkers in patients with corrected vitamin D levels across different demographic groups.

METHODS

A total of 26 patients were pre-diagnosed with relapsing-remitting MS (RRMS) and analyzed at baseline (or at the first visit during which all analyzed measures could be acquired). Patients were divided into high (n=7) and low (n=19) vitamin A level groups to determine if a correlation existed between vitamin A levels and lesion volumes or EDSS scores. Low vitamin A level was considered as any value less than or equal to 68.5 mcg/dL, and high vitamin A level was considered as any value greater than 49 mcg/dL. Additionally, patients were categorized by race (13 Hispanic whites, 4 non-Hispanic whites, 9 non-Hispanic blacks), gender (15 female, 11 male), age (6 born after 1985, 13 born between 1975 and 1985, 7 born before 1975), and year of diagnosis (14 diagnosed after 2010, 12 diagnosed before 2010).

To correct for vitamin D level, patients were given oral supplements to ensure that 25-OH Vitamin D levels were greater than or equal to 30.00 ng/mL. EDSS scores and lab values for vitamin D, vitamin A, carotene, total cholesterol, high-density lipoproteins, low-density lipoproteins, and triglyceride levels were collected every three months. MRI's of the brain and spine were taken every six months. The MRIs of the brain were processed in the software MIPAV to calculate lesion volumes (mm3). The patients' axial T2 FLAIR and FSPGR 3D axial series were co-registered and analyzed via MIPAV's "LesionTOADS" plugin. This plugin served as a brain segmentation device to ultimately generate lesion volume as well as other brain structure volumes.

Statistical analysis was performed at a single time point, with all EDSS scores and lab values taken at baseline, and all calculated lesion volumes derived from the first MRI taken for each patient. T-tests were performed with regards to EDSS scores, lesion volumes, and lab values between low and high vitamin A groups, individual racial groups, individual gender groups, individual age groups, and individual year of diagnosis groups. ANOVA tests were performed across all racial, all gender, all age, and all year of diagnosis groups.

Patient Demographics

CATEGORY	N VALUE
High Vitamin A Level	7
Low Vitamin A Level	19
Hispanic Whites	13
Non-Hispanic Whites	4
Non-Hispanic Blacks	9
Female	15
Male	11
Born After 1985	6
Born Between 1975 and 1985	13
Born Before 1975	7
Diagnosed After 2010	14
Diagnosed Before 2010	12

Table 1. An overview of the patient population (n=26). The number of patients within each demographic category with respect to vitamin A level, race, gender, age, and year of diagnosis are illustrated.

RESULTS

With the exception of the comparison of RBP levels in the low and high vitamin A groups (P=0.019), vitamin D levels between the Hispanic white and non-Hispanic black groups (P=0.030), lesion volumes between the male Hispanic white and male non-Hispanic black groups (P=0.009), lesion volumes between the male non-Hispanic white and male non-Hispanic black groups (P=0.009), and lesion volumes across all racial groups amongst males (P=0.005), no significant differences of note were seen (P > 0.05).

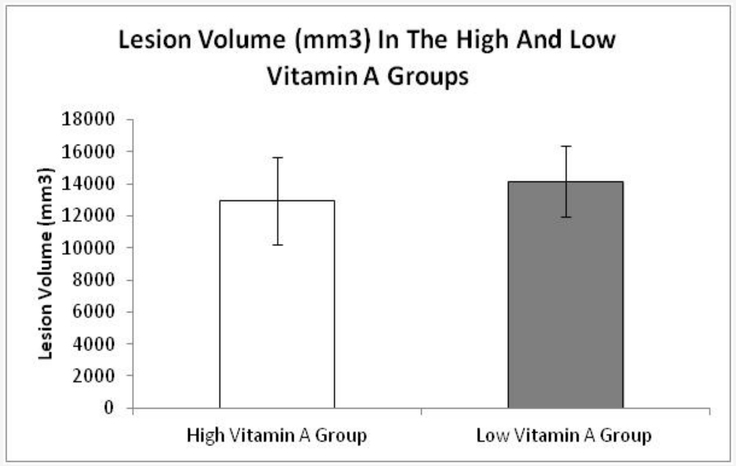

Figure 1. Lesion volume (mm3) in the high and low vitamin A groups. A bar graph of the average lesion volumes of the high (n=7) and low (n=19) vitamin A groups. No significant differences were found between the average lesion volumes of the two groups. *Average lesion volume (mm3) of the high vitamin A group: 12938.22. Average lesion volume (mm3) of the low vitamin A group: 14142.47. Standard error of the mean for the high vitamin A group: 2752.742534. Standard error of the mean for the low vitamin A group: 2202.712776.*

GROUPS	EDSS	VITAMIN A (mcg/dL)	RBP (mg/dL)	CAROTENE (mcg/dL)	VIT D (ng/mL)	TC (mg/dL)	HDL (mg/dL)	LDL (mg/dL)	TGL (mg/dL)	Lesion Volume (mm3)
1,2	0.628311	0.337036	0.860887	0.209216	0.378292	0.412879	0.167981	0.081489	0.635748	0.405017
1,3	0.586309	0.941432	0.261457	0.801968	**0.030321**	0.335593	0.59527	0.399707	0.14833	0.142949
2,3	0.934515	0.411698	0.250927	0.23293	0.350427	0.933715	0.402334	0.485713	0.413002	0.128014
1, 2, 3	0.812121	0.557177	0.4529	0.4014	0.066324	0.551909	0.337236	0.297112	0.319361	0.145321
F, M	0.740814	0.341209	0.320754	0.474304	0.947601	0.370994	0.807979	0.451153	0.519835	0.635648
F1, F2	0.374404	0.874163	0.484412	0.147104	0.337157	0.133008	0.346724	0.187237	0.543041	0.848733
F1, F3	0.695079	0.903185	0.201045	0.406849	0.110484	0.099024	0.93146	0.190389	0.133481	0.441967
F2, F3	0.535767	0.865321	0.891797	0.161827	0.599512	0.768656	0.618053	0.839342	0.578494	0.70651
M1, M2	0.848525	0.238744	0.553928	0.607643	0.806762	0.868908	0.076844	0.225318	0.96738	0.102949
M1, M3	0.707061	0.890509	0.827587	0.308505	0.137012	0.965846	0.891674	0.784525	0.483883	**0.009832**
M2, M3	0.698489	0.476755	0.38022	0.670707	0.474715	0.927794	0.410808	0.50833	0.665506	**0.009687**
F1, F2, F3	0.145321	0.970518	0.432328	0.229158	0.244038	0.167664	0.813501	0.31601	0.272879	0.704961
M1, M2, M3	0.897166	0.444074	0.755807	0.552291	0.260308	0.980248	0.133293	0.520183	0.784665	**0.005125**
4, 5	0.871438	0.808177	0.40563	0.817776	0.191779	0.333589	0.584664	0.596572	0.854529	0.458308
(4)1, (4)2	0.350617	0.058062	0.632008	0.10782	0.551194	0.743654	0.156633	0.165247	0.680642	0.633671
(4)1, (4)3	0.464676	0.723189	0.154448	0.529968	0.025267	0.501549	0.598244	0.674135	0.328494	0.253358
(4)2, (4)3	0.667219	**0.032909**	0.051238	0.19196	0.307731	0.926549	0.203086	0.314834	0.099041	0.308752
(5)1, (5)2	0.122806	0.212121	0.560516	0.787242	0.507633	0.440784	0.760495	0.404629	0.447483	0.537901
(5)1, (5)3	0.168458	0.476235	0.455251	0.721792	0.348733	0.5235	0.347314	0.467318	0.326876	0.437276
(5)2, (5)3	0.651438	0.212121	0.361831	1	0.778463	0.898867	0.670687	0.995828	0.960002	0.373498
(4)1, (4)2, (4)3	0.55076	0.057994	0.20145	0.241744	0.059042	0.79826	0.159407	0.373037	0.427122	0.351946
(5)1, (5)2, (5)3	0.174842	0.284531	0.535487	0.914743	0.595176	0.713869	0.589901	0.694332	0.491257	0.512789
6, 7	0.44617	0.909255	0.968197	0.066613	0.955342	0.808519	0.651937	0.828837	0.816188	0.832477
6, 8	0.226124	0.726733	0.793779	0.067726	0.615918	0.531395	0.499672	0.941563	0.251021	0.993733
7, 8	0.705742	0.661112	0.837911	0.916038	0.5317	0.73653	0.660561	0.726441	0.189832	0.777782
6, 7, 8	0.497401	0.870093	0.960856	0.154206	0.78089	0.82014	0.722272	0.941911	0.246331	0.960853
9, 10	0.31631	**2.05E-07**	0.019872	0.170835	0.435426	0.63619	0.524736	0.955361	0.731457	0.766726

Table 2. Statistical analysis of all patient category groups. The P values of the T-tests and ANOVA tests are illustrated. Groups have been identified by symbolic numbers and letters (1=Hispanic whites, 2=Non-Hispanic whites, 3=Non-Hispanic blacks, F=Females, M=Males, 4=Patients Diagnosed After 2010, 5=Patients Diagnosed Before 2010, 6=Patients Born After 1985, 7=Patients Born Between 1975 And 1985, 8=Patients Born Before 1975, 9=High Vitamin A Group, 10=Low Vitamin A Group). Significant differences (P < 0.5) are bolded in red.

RESULTS

The lack of significant findings could largely be attributed to the low sample size of the study, as well as the lack of consistency in the time at which the data was collected. Further studies are required to produce a more definitive understanding of the relationship between MS and vitamin A.

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DISCLOSURE

The authors report no conflicts of interest in this work.

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