

Geriatric Female Longevity Associated with Elevated Parasympathetic Tone. Can the Same be Affected in Geriatric Males?

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BACKGROUND

Holter time-domain heart rate variability (TDHRV) measures (GE/MARS and Burdick) indicate that geriatric females have more parasympathetic tone than do geriatric males [Umetani, *et al.*, 1998]. Further, it is known that geriatric females have greater longevity than do geriatric males. The greater parasympathetic tone is associated with the greater longevity in females. It may be that the greater parasympathetic tone enables a greater degree of protection from cardiac stress through a reduction in the corresponding sympathetic tone. This hypothesis is supported by the fact that the incidence of cardiac events associated with non-sustained ventricular tachyarrhythmia has greatly diminished and the life expectancy of heart failure patients has greatly increased since the advent of beta-1-adrenergic blockers.

Spectral domain HRV (SDHRV) with spectral analysis of respiratory activity (known as autonomic function computation, or AFC) has been shown to be a more accurate means of measuring both autonomic branches independently, simultaneously, non-invasively, and quantitatively. Short-term (15.5') AFC assessment also suggests that elevated parasympathetic tone is associated longevity and fewer co-morbidities in geriatric females [Ali, *et al.*, 2006; Waheed, *et al.*, 2006]. Elevated parasympathetic tone can present as a low-normal sympathovagal balance (SB=ratio of sympathetic tone to parasympathetic tone as computed by AFC). We hypothesize that the low normal SB sub-population will have the greatest number of patients living the longest, including males. The corollary to this hypothesis is that the more "male-like" high normal SB (indicating elevated sympathetic tone) will include females with shorter life spans.

If low-normal SB (elevated parasympathetic tone) is associated with longevity (rather than gender) and if sympathetic blockade induces low-normal SB, it may be that the use of adrenergic blockade to establish and maintain elevated parasympathetic activity could promote longevity and may be associated with fewer-comorbidities and thereby reduced healthcare costs.

METHODS

Autonomic profiling was performed on 1008 consecutive geriatric cardiology patients (Table 1: Diabetics=143; Females=560; age=74.2±6.17) recruited over a five year period (2001-2005) from 38 ambulatory clinics nationwide. Excluded from the study were any patients with atrial fibrillation or ventricular arrhythmia. Autonomic profiling was based on resting sympathetic and parasympathetic indices: Holter TD-HRV (sdNN, rmsSD, & pNN50), spectral domain HRV (LF, HF, & LF/HF), and AFC (LFa, RF, & LFa/RFa). The LFa/RFa ratio is a measure of sympathovagal balance (SB). The normal range for normal SB is 0.4 to 3.0. SB was divided into four categories: 1) abnormally low (SB<0.4); 2) low-normal (0.4<SB<1.0); 3) high-normal (1.0<SB<3.0); and 4) abnormally high (SB>3.0). Low-normal SB results from elevated parasympathetic tone and is associated with geriatric female trends. High-normal SB results from elevated sympathetic tone and is associated with geriatric male trends. Abnormally low SB is

associated with excessive parasympathetic tone. Abnormally high SB is associated with excessive sympathetic tone.

Table 1: Patient cohort population statistics by age.

Age	65-69	70-74	75-79	80-84	85-89	90-94	95-99	Total
Female	142	153	153	87	16	5	3	560
Male	150	134	98	60	3	3	0	448
Total	292	287	251	148	19	8	3	1008

RESULTS & DISCUSSION

In all four SB categories females survived longer than males except in the high SB cases where there were no gender differences. In the abnormally-low and abnormally high categories, no male lived past 84. Some females lived past 84 in the abnormally-low category, but not past 89. In the high-normal category, males again did not live past 84. However, females in the high normal category lived into their low 90's. Only in the low-normal category did males live past 84. In fact they lived into their low 90's; a 10-year increase in life span over the other three SB categories. Females in the low-normal category had the longest life span with some patients living into their late 90's. This is a 10 year increase in life span over the abnormal SB categories and a 5 year increase over the high-normal SB category. Overall life expectancy was 10 years greater for the normal categories than for the abnormal categories in both genders.

It is known that too much parasympathetic tone is associated with low heart rate, persistent fatigue, shortness of breath, depression, and general malaise. Too much parasympathetic tone is associated with abnormally low SB. It is known that too much sympathetic tone is associated with cardiac and vascular stress. Too much sympathetic tone is associated with abnormally high SB. These are regions to avoid. Empirical evidence suggests that high-normal SB is associated with health in younger subjects and low-normal SB is associated with health in older subjects.

These results suggest that from a simple measure of autonomic balance, namely SB, coupled with the application of β -blockers, a patient's longevity may be optimized through objectively titrating therapy to lower sympathetic tone and coincidentally raise parasympathetic tone such that a patient's SB is low-normal.

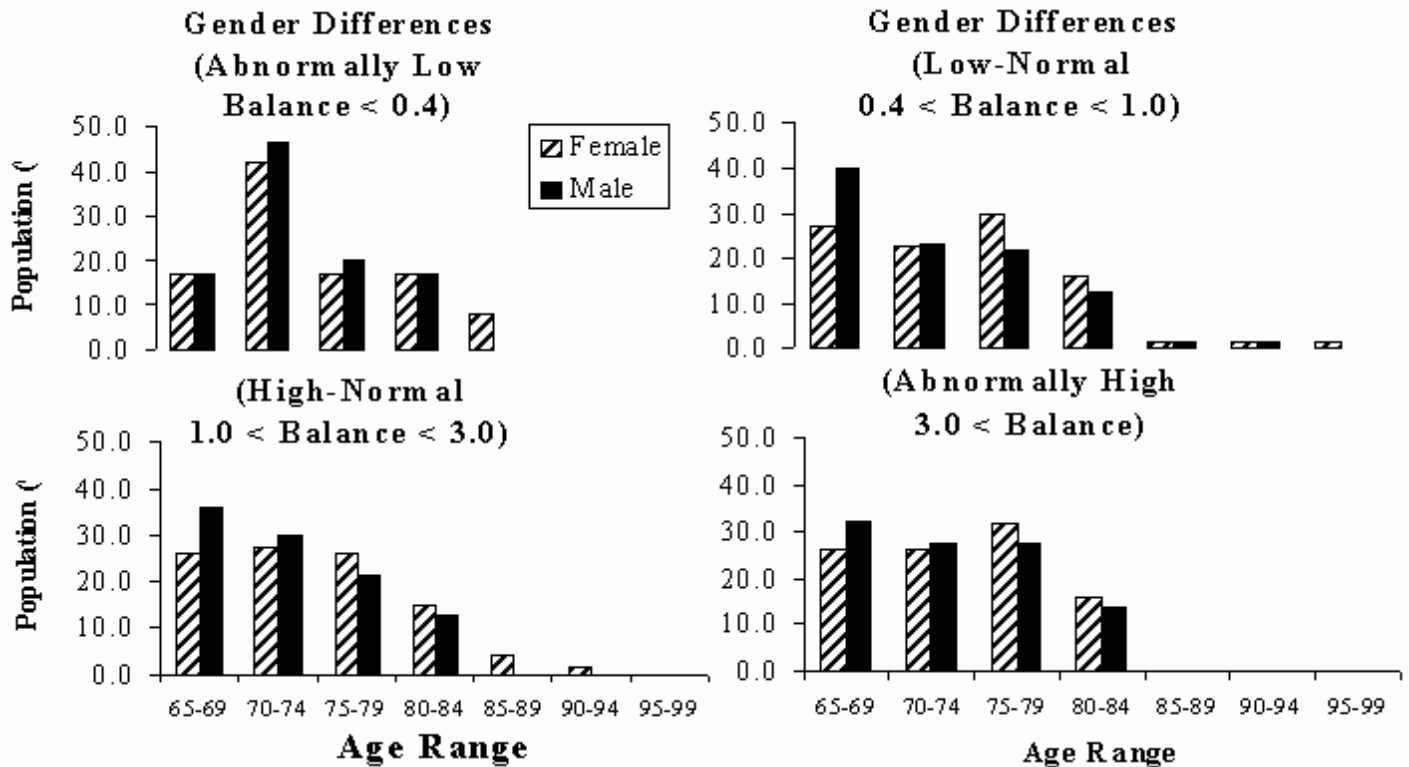


Figure 1: Geriatric patient data showing gender longevity differences based on sympathovagal balance (Balance = LFa/RFa). Normal range for Balance is 0.4 to 3.0. Below 0.4 and above 3.0 is abnormal. The normal range was divided into above and below 1.0, where 1.0 is a perfect balance (LFa = RFa). Low normal indicates parasympathetic dominance and is associated with geriatric female trends. High-normal indicates sympathetic dominance and is associated with geriatric male trends. Geriatric females are known to have greater longevity.

CONCLUSIONS

Males with female-like SB (with higher parasympathetic activity) live longer than males without, and females with male-like SB (lower parasympathetic activity) have a shorter-life expectancy than females without. It may be that low normal SB is associated with optimal longevity for a given patient.

REFERENCES

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