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MONITORED DAILY AMBULATORY ACTIVITY, INFLAMMATION, AND OXIDATIVE STRESS IN PATIENTS WITH CLAUDICATION

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Abstract

We determined the association between daily ambulatory activity and markers of inflammation and oxidative stress in patients with peripheral artery disease (PAD) and claudication. Patients with PAD (n=134) limited by claudication were studied. Patients took 3275±1743 daily strides during 273±112 min each day, and their average daily cadence was 11.7±2.7 strides/min. High-sensitivity C-reactive protein was significantly and negatively associated with the total number of daily strides (p<0.001), total daily ambulatory time (p<0.01), peak activity index (p<0.01), daily average cadence (p<0.05), and the maximum cadences for 60 min (p<0.05), 30 min (p<0.05), 20 min (p<0.05) and 5 min (p<0.01). Oxidized low density lipoprotein and soluble vascular cell adhesion molecule-1 were not significantly associated with any of the ambulatory measures (p>0.05). We conclude that higher levels of community-based, daily ambulatory activity are associated with lower levels of inflammation, but are not associated with markers of oxidative stress.

Keywords

Claudication; C-Reactive Protein; Oxidized Low Density Lipoprotein; Peripheral Artery Disease

INTRODUCTION

Peripheral artery disease (PAD) is prevalent in more than 12% of the US population aged 65 years and older.¹ PAD is associated with increased prevalence of cardiovascular disease risk

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factors,^{1, 2} and increased prevalence of coexisting diseases in the coronary, cerebral, and renal arteries.^{1, 2} More than 60% of those with PAD have concomitant cardiovascular and/or cerebrovascular disease,² thereby contributing to their elevated rates of mortality.^{3, 4} Additionally, many of those with PAD are physically limited by ambulatory leg pain, resulting in ambulation dysfunction,^{5, 6} impaired physical function,^{7, 8} and lower physical activity levels.^{9, 10} A primary clinical goal is to improve ambulatory function, thereby lessening limitations in physical function and daily activity, and improving health-related quality of life.

Supervised exercise programs are efficacious for clinical management of claudication,¹¹ and has been given a Class IA recommendation by the American College of Cardiology (ACC) and the American Heart Association (AHA) indicating general agreement for effectiveness of treatment.¹ Despite the favorable overall benefits of exercise rehabilitation programs on claudication measures, acute bouts of exercise induce ischemia in the active musculature, increasing the production of reactive oxygen species and inflammation.^{12–15} Inflammation and oxidative stress lead to accelerated myopathy by damaging mitochondrial electron transport chain function, thereby reducing energy production and increasing apoptosis and sarcopenia.^{16, 17} Repeated bouts of ischemia during ambulation followed by reperfusion during subsequent periods of rest throughout the day is thought to result in accumulation of inflammation and oxidative stress markers, which are exaggerated even further when walking to maximal claudication pain than walking to the onset of pain.¹⁴ However, the impact that the intensity of ambulation (i.e. cadence) and the volume of ambulation (total number of strides taken throughout the day and minutes spent ambulating) have on inflammation and oxidative stress in patients with PAD and claudication is not clear.

We determined the association between daily ambulatory activity and markers of inflammation and oxidative stress in patients with PAD and claudication. Our hypothesis was that faster cadence of ambulation and more strides taken each day are associated with higher levels of inflammation and oxidative stress.

METHODS

Patients

Approval and Informed Consent—The procedures used in this study were approved by the Institutional Review Board at the University of Oklahoma Health Sciences Center (HSC) and by the Research and Development committee at the Oklahoma City VA Medical Center. Written informed consent was obtained from each patient prior to investigation.

Recruitment—Patients were recruited by referrals from vascular and primary care clinics from the University of Oklahoma HSC and the Oklahoma City VA Medical Center, and by newspaper advertisements for possible enrollment into a randomized controlled exercise rehabilitation study for the treatment of leg pain secondary to PAD.¹⁸ The data and analyses for this study were part of the baseline assessments obtained for the exercise study. Patients were evaluated in the General Clinical Research Center (GCRC), at the University of Oklahoma HSC.

Medical Screening through History, Physical Examination and Anthropometry

—Patients arrived at the GCRC in the morning fasted, but were permitted to take their usual morning medication. Demographic information, height, weight, cardiovascular risk factors, co-morbid conditions, claudication history, blood samples, and a list of current medications were obtained from a medical history and physical examination at the beginning of the study. During the physical examination, arterial oxygen saturation was measured from the index finger using a standard pulse oximeter. Afterwards, subcutaneous fat over the medial gastrocnemius muscle was measured from a skinfold using a Lange skinfold caliper according to standard guidelines,¹⁹ and waist circumference was recorded using a plastic measuring tape.¹⁹

Inclusion and Exclusion Criteria—Patients with PAD were included in this study if they met the following criteria: (a) a history of any type of ambulatory leg pain, (b) ambulatory leg pain confirmed during a graded treadmill test,⁵ and, (c) an ankle/brachial index (ABI) 0.90 at rest¹ or an ABI 0.73 after exercise because some PAD patients have normal values at rest which only become abnormal following an exercise test.²⁰ Patients were excluded from this study for the following conditions: (a) absence of PAD (ABI > 0.90 at rest and ABI > 0.73 after exercise), (b) inability to obtain an ABI measure due to non-compressible vessels, (c) asymptomatic PAD determined from the medical history and verified during the graded treadmill test, (d) use of medications indicated for the treatment of claudication (cilostazol and pentoxifylline) initiated within 3 months prior to investigation, (e) exercise tolerance limited by any disease process other than PAD, (f) active cancer, (g) end stage renal disease defined as stage 5 chronic kidney disease, and, (h) abnormal liver function. A consecutive series of 188 individuals were evaluated for study eligibility, and 134 patients were deemed eligible.

Measures

Vascular Biomarkers: Oxidized low density lipoprotein (LDL), high-sensitivity C-reactive protein (hsCRP), and soluble vascular cell adhesion molecule-1 (sVCAM-1)

Blood Sampling: Venipuncture was done to obtain the blood specimen from an antecubital vein. The blood was collected in vacutainers and then distributed in 0.5 ml aliquots. The samples were stored at -80°C , and were subsequently batched for analysis.

Oxidized LDL and sVCAM-1: Plasma oxidized LDL and sVCAM-1 were measured by immunoassay (Mercodia, Uppsala, Sweden and R&D Systems, Minneapolis, MN, respectively) according to the manufacturer's protocol. For oxidized LDL, average intra-assay precision is 5% and inter-assay precision is 8.7%. For sVCAM-1, average inter-assay precision is 3.9%.

hsCRP: A high-sensitivity Near Infrared Particles Immunoassay was used to quantify the concentration of hsCRP from a serum sample of 300 μl , the optimum sample volume for this specific assay. A commercially available device, the SYNCHRON LX-20 (Beckman-Coulter; California, USA), was used to automatically perform the assay. Prior to performing each assay, the SYNCHRON system was calibrated, and a calibration curve was established.

The “normal” reference range for concentrations of hsCRP using this high-sensitivity assay is 0.0–3.3 mg/L.²¹

Graded Treadmill Test: Claudication Onset Time (COT), peak walking time (PWT) and Ischemic Window

COT and PWT: Patients performed a progressive, graded treadmill protocol to determine study eligibility, as well as to obtain outcome measures related to peak exercise performance.⁵ The COT, measured as the walking time at which the patient first experienced pain, and the PWT, measured as the walking time at which ambulation could not continue due to maximal pain, were both recorded to quantify the severity of claudication. Using these procedures, the test-retest intraclass reliability coefficient is $R = 0.89$ for COT,⁵ and $R = 0.93$ for PWT.⁵

Ischemic Window: ABI measures were obtained from the more severely diseased lower extremity before and 1, 3, 5, and 7 min after the treadmill test.^{5, 22} The reduction in ankle systolic blood pressure after treadmill exercise from the resting baseline value was quantified by calculating the area under the curve, referred to as the ischemic window.²³ Because the ischemic window is a function of both PAD severity and the amount of exercise performed, the ischemic window was normalized per meter walked.

Ambulatory Activity Monitoring—Daily ambulatory activity was assessed using a step activity monitor (StepWatch3™, OrthoInnovations, Inc., Oklahoma City, OK) as previously described.²⁴ Ambulatory activity was measured during 7 consecutive days in which patients were instructed to wear the monitor during waking hours and to remove it before retiring to bed and while showering. The step activity monitor was attached to the right ankle above the lateral malleolus using an elastic Velcro strap, and continuously recorded the number of strides taken each day and the number of minutes spent ambulating each day. The daily ambulatory strides and time are further analyzed by the software program, and are quantified into the following variables: maximum cadence for 60, 30, 20, and 5 continuous min of ambulation each day, maximum cadence for 1 min of ambulation each day (i.e. the minute having the single highest cadence value each day), and peak activity index obtained by ranking all minutes of the day according to cadence, and then taking the highest 30 values. These outcome measures are recorded and averaged for each day, and then the daily averages are averaged over the 7-day monitoring period. The accuracy of the step activity monitor exceeds $99\% \pm 1\%$ in patients with claudication,²⁴ and the test-retest intraclass reliability coefficient for the daily ambulatory activity measures range from $R = 0.83$ to $R = 0.94$.²⁴

Statistical Analyses

Measurement variables were summarized as means and standard deviations. Dichotomous variables were summarized as percent with characteristic present, percent male, or percent Caucasian. For all between subject variables, measures of association were computed as partial correlations controlled for age, race, gender, and obesity. As a guard against departure for normality assumptions yielding inappropriate associations, both Pearson and Spearman correlations were computed with Spearman reported if the coefficients differed by

more than 0.10. Statistical significance was defined by a two-sided $p < 0.05$. All summary statistics and test were computed using the NCSS computer package.

RESULTS

The clinical characteristics of the patients with claudication are shown in Table 1. The group consisted of a mix of older, overweight Caucasian and African-American men and women. Cardiovascular risk factors were highly prevalent in the group, particularly hypertension, dyslipidemia and metabolic syndrome. Consequently, 83% of patients were treated for hypertension, 75% were treated for dyslipidemia with statin medication, and 39% were treated for diabetes.

Daily ambulatory activity measures recorded during a 1-week monitoring period, and their associations with measures of inflammation and oxidative stress in patients with claudication are shown in Table 2. On average, the patients took 3275 daily strides during 273 min each day. The daily average cadence was 11.7 strides/min, ranging between 10.8 strides/min for the most active 60 consecutive minutes of each day to 45.0 strides/min for the most active single minute of each day. hsCRP was significantly and negatively associated with the total number of daily strides ($p < 0.001$), total daily ambulatory time ($p < 0.01$), peak activity index ($p < 0.01$), daily average cadence ($p < 0.05$), and the maximum cadences for 60 min ($p < 0.05$), 30 min ($p < 0.05$), 20 min ($p < 0.05$) and 5 min ($p < 0.01$). Oxidized LDL and sVCAM-1 were not significantly associated with any of the ambulatory measures ($p > 0.05$).

DISCUSSION

Monitored Daily Ambulatory Activity is Negatively Associated with Inflammation

A novel finding in this investigation was that both the intensity of community-based, daily ambulation (i.e. cadence), and the volume of daily ambulation (total number of strides taken and minutes spent ambulating throughout the day), were negatively associated with hsCRP but were not associated with oxidized LDL and sVCAM-1. Although previous reports have shown that a single acute bout of exercise during a standardized laboratory test increases the production of reactive oxygen species and inflammation,^{12–15} the methodology was not designed to address whether ambulatory activity throughout the day results in a more chronic accumulation of inflammatory and oxidative stress markers. Our methodology provides a novel and valid measure of ambulation performed in the community setting in which numerous acute bouts of ambulation and rest are interspersed throughout the day.

According to previous findings,^{12–15} increased reactive oxygen species and inflammation following an acute ambulatory bout should have resulted in a net accumulation in inflammation and reactive oxygen species from repeated ambulatory bouts throughout the day. The negative correlation between hsCRP and ambulatory cadence, number of daily strides, and number of minutes spent in ambulation may indicate one or more possibilities. For example, the amount of hsCRP generated from each acute bouts of ambulation may diminish throughout the day, the numerous repeated bouts of ambulation may serve as a form of exercise training in which chronic adaptations reduce the production of markers of

inflammation and oxidative stress,¹⁵ compensatory mechanisms may occur such as increased antioxidant defenses,¹³ or a combination of all these factors may occur. Our study supports the well-established negative relationship between hsCRP and physical activity levels reported in patients with coronary heart disease^{25, 26} and extends this observation to patients with PAD and claudication.

There are limitations to this study. A self-selection bias may exist regarding study participation, as patients who participated in this trial were volunteers. Therefore, they may represent those who were more interested in participation, who had better access to transportation to the research center, and who had relatively better health than PAD patients who did not volunteer. Furthermore, the results of this study are only applicable to PAD patients who are limited by claudication, and may not be generalized to patients with less severe or more severe PAD. Additionally, nearly all of the patients with dyslipidemia were being treated with statin medication, which may have improved their ambulation, inflammation, and oxidative stress measures.^{27–29} Finally, there are limitations associated with the design of the study. The correlations calculated between the clinical measures and the vascular biomarkers from this cross-sectional design do not allow causality to be established.

Although we directly measured ambulatory activity, there are limitations associated with the step activity monitor. It is possible that the patients did not wear the step activity monitor during portions of their waking hours, thereby resulting in an underestimate of daily ambulation. We believe this possibility is unlikely because long durations in which no active minutes were recorded during daytime hours were not evident from the software graphs. Another limitation is that the step activity monitor does not quantify non-ambulatory physical activity, and therefore it underestimates the total amount of daily physical activity accomplished to some extent.

In summary, the primary finding was that greater daily ambulatory activity was associated with lower levels of hsCRP. We conclude that higher levels of community-based, daily ambulatory activity are associated with lower levels of inflammation, but are not associated with markers of oxidative stress. The clinical significance is that an ambulatory exercise program performed in the community setting may favorably impact markers of hsCRP and other markers of inflammation in patients with PAD and claudication.

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References

1. Hirsch AT, Haskal ZJ, Hertzner NR, et al. ACC/AHA 2005 Practice Guidelines for the management of patients with peripheral arterial disease (lower extremity, renal, mesenteric, and abdominal aortic): a collaborative report from the American Association for Vascular Surgery/Society for Vascular Surgery, Society for Cardiovascular Angiography and Interventions, Society for Vascular Medicine and Biology, Society of Interventional Radiology, and the ACC/AHA Task Force on Practice Guidelines (Writing Committee to Develop Guidelines for the Management of Patients With Peripheral Arterial Disease): endorsed by the American Association of Cardiovascular and

- Pulmonary Rehabilitation; National Heart, Lung, and Blood Institute; Society for Vascular Nursing; TransAtlantic Inter-Society Consensus; and Vascular Disease Foundation. *Circulation*. 2006; 113(11):e463–e654. [PubMed: 16549646]
2. Norgren L, Hiatt WR, Dormandy JA, Nehler MR, Harris KA, Fowkes FG. Inter-Society Consensus for the Management of Peripheral Arterial Disease (TASC II). *J Vasc Surg*. 2007; 45(Suppl):SS5–67.
 3. Brass EP, Hiatt WR. Review of mortality and cardiovascular event rates in patients enrolled in clinical trials for claudication therapies. *Vasc Med*. 2006; 11(3):141–145. [PubMed: 17288119]
 4. Criqui MH, Langer RD, Fronek A, et al. Mortality over a period of 10 years in patients with peripheral arterial disease. *N Engl J Med*. 1992; 326(6):381–386. [PubMed: 1729621]
 5. Gardner AW, Skinner JS, Cantwell BW, Smith LK. Progressive vs single-stage treadmill tests for evaluation of claudication. *Med Sci Sports Exerc*. 1991; 23(4):402–408. [PubMed: 2056896]
 6. Hiatt WR, Nawaz D, Regensteiner JG, Hossack KF. The evaluation of exercise performance in patients with peripheral vascular disease. *J Cardiopulmonary Rehabil*. 1988;12525–532.
 7. McDermott MM, Greenland P, Liu K, et al. Leg symptoms in peripheral arterial disease: associated clinical characteristics and functional impairment. *JAMA*. 2001; 286(13):1599–1606. [PubMed: 11585483]
 8. McDermott MM, Liu K, Greenland P, et al. Functional decline in peripheral arterial disease: associations with the ankle brachial index and leg symptoms. *JAMA*. 2004; 292(4):453–461. [PubMed: 15280343]
 9. McDermott MM, Liu K, O'Brien E, et al. Measuring physical activity in peripheral arterial disease: a comparison of two physical activity questionnaires with an accelerometer. *Angiology*. 2000; 51(2):91–100. [PubMed: 10701716]
 10. Sieminski DJ, Gardner AW. The relationship between free-living daily physical activity and the severity of peripheral arterial occlusive disease. *Vasc Med*. 1997; 2(4):286–291. [PubMed: 9575600]
 11. Gardner AW, Poehlman ET. Exercise rehabilitation programs for the treatment of claudication pain. A meta-analysis. *JAMA*. 1995; 274(12):975–980. [PubMed: 7674529]
 12. Hickman P, Harrison DK, Hill A, et al. Exercise in patients with intermittent claudication results in the generation of oxygen derived free radicals and endothelial damage. *Adv Exp Med Biol*. 1994;361565–570.
 13. Khaira HS, Maxwell SR, Shearman CP. Antioxidant consumption during exercise in intermittent claudication. *Br J Surg*. 1995; 82(12):1660–1662. [PubMed: 8548234]
 14. Silvestro A, Scopacasa F, Oliva G, de Cristofaro T, Iuliano L, Brevetti G. Vitamin C prevents endothelial dysfunction induced by acute exercise in patients with intermittent claudication. *Atherosclerosis*. 2002; 165(2):277–283. [PubMed: 12417278]
 15. Turton EP, Coughlin PA, Kester RC, Scott DJ. Exercise training reduces the acute inflammatory response associated with claudication. *Eur J Vasc Endovasc Surg*. 2002; 23(4):309–316. [PubMed: 11991691]
 16. Pipinos II, Judge AR, Selsby JT, et al. The myopathy of peripheral arterial occlusive disease: part 1. Functional and histomorphological changes and evidence for mitochondrial dysfunction. *Vasc Endovascular Surg*. 2007; 41(6):481–489. [PubMed: 18166628]
 17. Pipinos II, Judge AR, Selsby JT, et al. The myopathy of peripheral arterial occlusive disease: Part 2. Oxidative stress, neuropathy, and shift in muscle fiber type. *Vasc Endovascular Surg*. 2008; 42(2):101–112. [PubMed: 18390972]
 18. Gardner AW, Parker DE, Montgomery PS, Scott KJ, Blevins SM. Efficacy of quantified home-based exercise and supervised exercise in patients with intermittent claudication: a randomized controlled trial. *Circulation*. 2011; 123(5):491–498. [PubMed: 21262997]
 19. Lohman, TC.; Roche, AF.; Marubini, E. Anthropometric standardization reference manual. Champaign, IL: Human Kinetics Books; 1988. p. 39-70.
 20. Hiatt WR, Marshall JA, Baxter J, et al. Diagnostic methods for peripheral arterial disease in the San Luis Valley Diabetes Study. *J Clin Epidemiol*. 1990; 43(6):597–606. [PubMed: 2189949]
 21. Torres JL, Ridker PM. High sensitivity C-reactive protein in clinical practice. *Am Heart Hosp J*. 2003; 1(3):207–211. [PubMed: 15785190]

22. Gardner AW. Reliability of transcutaneous oximeter electrode heating power during exercise in patients with intermittent claudication. *Angiology*. 1997; 48(3):229–235. [PubMed: 9071198]
23. Feinberg RL, Gregory RT, Wheeler JR, et al. The ischemic window: a method for the objective quantitation of the training effect in exercise therapy for intermittent claudication. *J Vasc Surg*. 1992; 16(2):244–250. [PubMed: 1495149]
24. Gardner AW, Montgomery PS, Scott KJ, Afaq A, Blevins SM. Patterns of ambulatory activity in subjects with and without intermittent claudication. *J Vasc Surg*. 2007; 46(6):1208–1214. [PubMed: 17919876]
25. Ford ES. Does exercise reduce inflammation? Physical activity and C-reactive protein among U.S. adults. *Epidemiology*. 2002; 13(5):561–568. [PubMed: 12192226]
26. Lavie CJ, Church TS, Milani RV, Earnest CP. Impact of physical activity, cardiorespiratory fitness, and exercise training on markers of inflammation. *J Cardiopulm Rehabil Prev*. 2011; 31(3):137–145. [PubMed: 21427600]
27. Aguilar EM, de Miralles JH, Gonzalez AF, Casariego CV, Moreno SB, Garcia FA. In vivo confirmation of the role of statins in reducing nitric oxide and C-reactive protein levels in peripheral arterial disease. *Eur J Vasc Endovasc Surg*. 2009; 37(4):443–447. [PubMed: 19211277]
28. McDermott MM, Guralnik JM, Greenland P, et al. Statin use and leg functioning in patients with and without lower-extremity peripheral arterial disease. *Circulation*. 2003; 107(5):757–761. [PubMed: 12578881]
29. Mohler ER III, Hiatt WR, Creager MA. Cholesterol reduction with atorvastatin improves walking distance in patients with peripheral arterial disease. *Circulation*. 2003; 108(12):1481–1486. [PubMed: 12952839]

Table 1

Clinical characteristics of 134 patients with peripheral artery disease. Values are means (SD) and percentages.

Variables	Values
Age (years)	65 (10)
Weight (kg)	83.4 (19.6)
Body Mass Index (kg/m ²)	29.4 (6.2)
Ankle/Brachial Index	0.72 (0.24)
Claudication Onset Time (sec)	190 (161)
Peak Walking Time (sec)	399 (273)
Ischemic Window (mmHg × min/meter)	−0.68 (1.19)
Sex (% Men)	53
Race (% Caucasian)	52
Current Smoking (% yes)	37
Hypertension (% yes)	84
Medication Use (% yes)	83
Number of Medications (n)	2.0 (1.3)
Dyslipidemia (% yes)	81
Medication Use (%)	75
Number of Medications (n)	1.0 (0.8)
Diabetes (% yes)	41
Medication Use (%)	39
Number of Medications (n)	0.7 (1.0)
Abdominal Obesity (% yes)	56
Metabolic Syndrome (% yes)	81
Metabolic Syndrome Components (n)	3.6 (1.3)
Obesity (% yes)	43
Lower Extremity Revascularization (% yes)	40
Coronary Artery Disease (% yes)	31
Myocardial Infarction (% yes)	19
Cerebrovascular Disease (% yes)	18
Cerebrovascular Accident (% yes)	17
Renal Disease (% yes)	5
Chronic Obstructive Pulmonary Disease (% yes)	28
Dyspnea (% yes)	58
Oxidized Low Density Lipoprotein (U/L)	69.9 (21.8)
High sensitivity C-Reactive Protein (mg/L)	5.2 (5.1)
Soluble Vascular Cell Adhesion Molecule-1 (ng/ml)	751.1 (256.1)

Table 2

Daily ambulatory activity recorded during a one-week monitoring period and their associations (r) with measures of inflammation and oxidative stress in 134 patients with claudication.

Variables	Mean (SD)	Oxidized LDL	HsCRP	sVCAM-1
Maximum 1-min cadence (strides/min)	45.0 (7.0)	−0.04	−0.13	−0.08
Maximum 5-min cadence (strides/min)	28.9 (8.2)	−0.01	−0.25 [†]	−0.06
Maximum 20-min cadence (strides/min)	17.9 (10.1)	0.06	−0.20 [*]	−0.14
Maximum 30-min cadence (strides/min)	14.6 (6.2)	−0.06	−0.20 [*]	−0.10
Maximum 60-min cadence (strides/min)	10.8 (4.7)	−0.08	−0.20 [*]	−0.10
Peak Activity Index (strides/min)	28.9 (7.6)	−0.03	−0.24 [†]	−0.09
Average Cadence (strides/min)	11.7 (2.7)	−0.11	−0.19 [*]	−0.07
Total Strides (strides/day)	3275 (1743)	−0.11	−0.30 [‡]	−0.08
Total Activity Time (min/day)	273 (112)	−0.09	−0.28 [†]	−0.09

r = Pearson partial correlation coefficients or Spearman partial correlation coefficients (indicated in italicized print), controlled for age, sex, race, and obesity. LDL = low density lipoprotein, hsCRP = high sensitivity C-reactive protein, sVCAM-1 = soluble vascular cell adhesion molecule-1

* p < 0.05,

[†] p < 0.01,

[‡] p < 0.001.