1. J Am Assoc Nurse Pract. 2014 Feb;26(2):85-90.

**Statins' effect on plasma levels of Coenzyme Q10 and improvement in myopathy with**

**supplementation.**

Littlefield N, Beckstrand RL, Luthy KE.

Author information: The Orthopedic Specialty Group, LDS Hospital Orthopedics, Salt Lake City, Utah.

PURPOSE: Heart disease is the leading cause of death in the United States.

HMG-CoA reductase inhibitors, or statins, are medications at the forefront of the

battle against cardiovascular disease. Despite their effectiveness, patient

compliance with statins has lagged because of medication cost and adverse

effects, namely myopathy. Myopathy is the most common side effect of statin use.

The purpose of this review is to report plasma levels of CoQ10 in patients taking

statins and then to determine the benefit of Coenzyme Q10 (CoQ10) supplementation

on statin-related myopathy as evidenced by symptomatic improvement and increase

in serum levels of CoQ10.

DATA SOURCES: CINAHL, Medline, Health Source: Nursing/Academic Edition, and

Cochrane Library.

CONCLUSIONS: Evidence from this review suggests that studies showed a significant

relationship between statin intake and decreased serum levels of CoQ10. A few

studies showed a benefit in symptoms of myalgia or improvement of serum levels of

CoQ10 with supplementation. One study showed no benefit of CoQ10 supplementation

when taken with statins. There were no risks of supplementation reported in any

of the studies.

IMPLICATIONS FOR PRACTICE: CoQ10 supplementation might benefit those patients

suffering from statin-induced myopathy as evidenced by the results of these

studies. Supplementation of CoQ10 at a dose of between 30 and 200 mg daily has

shown to have beneficial effects on statin myopathy with no noted side effects.

Further research is necessary. PMID: 24170646

2. J Clin Lipidol. 2013 May-Jun;7(3):187-93.

**A randomized trial of coenzyme Q10 in patients with statin myopathy: rationale and study design.**

Parker BA, Gregory SM, Lorson L, Polk D, White CM, Thompson PD.

Author information: Division of Cardiology, Henry Low Heart Center, 80 Seymour Street, Hartford

Hospital, Hartford, CT

BACKGROUND: Statins are the most commonly prescribed and effective medications

for reducing low-density lipoprotein levels. Some patients experience myopathic

symptoms during statin treatment. The etiology is not known, but depletion of

mevalonate pathway metabolites, including coenzyme Q10 (CoQ10), has been

suggested. Despite a lack of conclusive evidence supporting its utility, CoQ10

supplementation has been recommended to patients who experience myalgic symptoms.

OBJECTIVE: The Co-Enzyme Q10 in Statin Myopathy study is designed to examine the

effect of CoQ10 supplementation on the extent and intensity of muscle pain during

treatment with simvastatin.

METHODS: We will recruit patients with a documented history of myalgia during

statin treatment. The presence of statin-related myalgia will be confirmed in a

crossover run-in trial during which the presence and absence of symptoms will be

documented during statin and placebo treatment, respectively. Individuals

experience myalgic symptoms while taking statins but not placebo will be

randomized to receive simvastatin 20 mg daily plus either 600 mg daily of CoQ10

or placebo. Muscle pain intensity will be documented during weekly phone calls

via use of the Brief Pain Inventory, Short Form. Treatment will continue for 8

weeks or until muscle symptoms are reported continuously for 1 week or become

intolerable, and then subjects will crossover to the alternative treatment (CoQ10

or placebo).

RESULTS: This study is an ongoing clinical trial.

CONCLUSIONS: This study will determine the utility of CoQ10 for reducing pain

intensity in myalgic patients and will provide guidance for clinicians treating

patients with hypercholesterolemia who are intolerant to statins. PMID: 23725917

3. Scand Cardiovasc J. 2013 Apr;47(2):80-7.

**No effect of combined coenzyme Q10 and selenium supplementation on atorvastatin-induced myopathy.**

Bogsrud MP, Langslet G, Ose L, Arnesen KE, Sm Stuen MC, Malt UF, Woldseth B, Retterstøl K.

Author information: Department of Internal Medicine, Møre and Romsdal Health Trust, Ålesund

Hospital, Ålesund, Norway.

OBJECTIVE: The aim of the present study was to evaluate the possible effects of

Q10 and selenium supplementation on statin-induced myopathy (SIM), both for

subjective symptoms and muscle function.

DESIGN: Patients (N = 43) who had experienced previous or ongoing SIM on

atorvastatin therapy were recruited. Following a 6-week washout period during

which no statins were administered, the patients were re-challenged with 10 mg of

atorvastatin. Patients (N = 41) who experienced SIM continued the atorvastatin

treatment and were in addition randomized to receive 12 weeks supplement of 400

mg Q10 and 200 μg selenium per day or a matching double placebo. SIM was assessed

using 3 validated symptom questionnaires, and a muscle function test was

performed at the beginning and at the end of the study.

RESULTS: The patients receiving the active supplement experienced significant

increases in their serum Q10 and selenium concentrations compared with the group

receiving placebo. No statistically significant differences in symptom

questionnaire scores or muscle function tests were revealed between the groups.

CONCLUSIONS: Despite substantial increases in the serum Q10 and selenium levels

following the oral supplementation, this study revealed no significant effects on

SIM compared with the placebo. PMID: 23301875

4. Can J Physiol Pharmacol. 2013 Feb;91(2):165-70.

**Coenzyme Q(10) and selenium in statin-associated myopathy treatment.**

Fedacko J, Pella D, Fedackova P, Hänninen O, Tuomainen P, Jarcuska P, Lopuchovsky T, Jedlickova L

Author information: Pavol Jozef Safarik University, 1st Department of Internal Medicine, Centre of

Excellency for Atherosclerosis Research, Slovakia.

The objective of this study was to evaluate the possible benefits of coenzyme Q10

and selenium supplementation administered to patients with statin-associated

myopathy (SAM). Sixty eligible patients entered the pilot study. Laboratory

examination (CoQ10, selenium, creatin kinase) and intensity of SAM (visual scale)

were performed at baseline, after 1 month, and at the end of study at month 3.

Plasma levels of CoQ10 increased from 0.81 ± 0.39 to 3.31 ± 1.72 μmol/L in the

active group of patients treated by CoQ10, compared with the placebo (p = 0.001).

Also, the symptoms of SAM significantly improved in the active group (p < 0.001):

the intensity of muscle pain decreased from 6.7 ± 1.72 to 3.2 ± 2.1 (p < 0.01,

-53.4 ± 28.2%); muscle weakness decreased from 7.0 ± 1.63 to 2.8 ± 2.34 (p <

0.01, -60 ± 24.0%); muscle cramps decreased from 5.33 ± 2.06 to 1.86 ± 2.42, p <

0.01, -65 ± 28%); tiredness decreased from the initial 6.7 ± 1.34 to 1.2 ± 1.32

(p < 0.01, -82 ± 22%). We did not observe any significant changes in the placebo

group. In conclusion, supplementation of statin-treated patients with CoQ10

resulted in a decrease in the symptoms of SAM, both in absolute numbers and

intensity. Additional selenium supplementation was not associated with any

statistically significant decrease of SAM. However, it is not possible to draw

any definite conclusions, even though this study was carried out in double-blind

fashion, because it involved a small number of patients. PMID: 23458201

5. Expert Rev Cardiovasc Ther. 2012 Oct;10(10):1329-33.

**CoQ10 and L-carnitine for statin myalgia?** DiNicolantonio JJ

Author information: Wegmans Pharmacy, Ithaca, NY

Statins are a standard of care in many clinical settings such as acute myocardial

infarction and for patients having or at risk of cardiovascular (CV) disease.

This is based on a plethora of data showing reductions in CV events and

mortality. The CV benefit of statins can be partly explained by their ability to

inhibit of HMG-CoA reductase, which subsequently lowers cholesterol and decreases

the formation of mevalonate. However, the inhibition of the mevalonate pathway

decreases the formation of coenzyme Q10 (CoQ10) within the body. It has been a

long-standing theory that statin-associated muscle pain (myalgia) is caused, or

at least partly contributed by, a reduction in CoQ10 levels in muscle

mitochondria. One of the main side effects of statins is myalgia, which causes

the patient to either stop their statin or significantly reduce the dose of their

statin. The question of whether CoQ10 can help treat statin myopathy is a common

one encountered by clinicians in current day practice. PMID: 23190071

6. Neuro Endocrinol Lett. 2012;33 Suppl 2:98-101.

**The effect of coenzyme Q10 in statin myopathy.**

Zlatohlavek L, Vrablik M, Grauova B, Motykova E, Ceska R.

Author information: 3rd Department of Internal Medicine, Charles University and General Teaching

Hospital, Prague, Czech Republic.

OBJECTIVES: Statins significantly reduce CV morbidity and mortality.

Unfortunately, one of the side effects of statins is myopathy, for which statins

cannot be administered in sufficient doses or administered at all. The aim of

this study was to demonstrate the effect of coenzyme Q10 in patients with statin myopathy.

DESIGN/SETTING: Twenty eight patients aged 60.6±10.7 years were monitored (18

women and 10 men) and treated with different types and doses of statin. Muscle

weakness and pain was monitored using a scale of one to ten, on which patients

expressed the degree of their inconvenience. Examination of muscle problems was

performed prior to administration of CQ10 and after 3 and 6 months of dosing.

Statistical analysis was performed using Friedman test, Annova and Students t-test.

RESULTS: Pain decreased on average by 53.8% (p<0.0001), muscle weakness by 44.4%

(p<0.0001). The CQ10 levels were increased by more than 194% (from 0,903 μg/ml to

2.66 μg/ml; p<0.0001).

CONCLUSION: After a six-month administration of coenzyme Q10, muscle pain and

sensitivity statistically significantly decreased. PMID: 23183519

7. Angiology. 2011 Jul;62(5):415-21.

**Statin myopathy: significant problem with minimal awareness by clinicians and no emphasis by clinical investigators.** Whayne TF Jr

Author information: University of Kentucky, Gill Heart Institute, Lexington

High cardiovascular risk patients need reduction of low-density-lipoprotein

cholesterol (LDL-C) to <70 mg/dL (1.8 mmol/L). Statins are optimal treatment but

myopathy can be a limitation to their use. The incidence of statin-related

myopathy is difficult to determine but up to 10.5% appears an appropriate

estimate. Short-term trials report lower incidence than long-term trials.

Statin-related myopathy may be influenced by genetics and tends to be

dose-dependent. Ezetimibe can contribute to LDL-C reduction allowing a lower dose

of statin to be used. Another approach is to administer rosuvastatin twice

weekly. Statins have been shown to interfere with the cellular role of coenzyme

Q10. Coenzyme Q10 supplementation may decrease or prevent statin myopathy, but

this has not been proven. The occurrence of the most serious complication of

myopathy-rhabdomyolysis-is very rare, but awareness of the problem, risks, and

prevention are essential. PMID: 21421631

8. Curr Atheroscler Rep. 2010 Nov;12(6):407-13.

**Coenzyme Q(10) and statin myalgia: what is the evidence?** Mas E, Mori TA.

Author information: School of Medicine and Pharmacology, Royal Perth Hospital Unit, University of

Western Australia, Medical Research Foundation Building Australia.

Statins lower cholesterol by inhibiting 3-hydroxy-3-methylglutaryl coenzyme A

(HMG-CoA) reductase, the rate-limiting enzyme in the biosynthesis of cholesterol.

However, severe adverse events, including myalgias and rhabdomyolysis, have been

reported with statin treatment. Different mechanisms have been proposed to

explain statin-induced myopathy, including reduction of mevalonate pathway

products, induction of apoptosis, mitochondrial dysfunction, and genetic

predisposition. A decrease in coenzyme Q(10) (CoQ), a product of the mevalonate

pathway, could contribute to statin induced myopathy. This article reviews the

clinical and biochemical features of statin-induced myopathy, the

inter-relationship between statins and the concentration of CoQ in plasma and

tissues, and whether there is a role for supplementation with CoQ to attenuate

statin-induced myopathy. PMID: 20725809

9. Curr Atheroscler Rep. 2010 Sep;12(5):322-30.

**Evidence-based management of statin myopathy.** Harper CR, Jacobson TA.

Author information: Department of Medicine, Emory University, Atlanta, GA

Statin-associated muscle symptoms are a relatively common condition that may

affect 10% to 15% of statin users. Statin myopathy includes a wide spectrum of

clinical conditions, ranging from mild myalgia to rhabdomyolysis. The etiology of

myopathy is multifactorial. Recent studies suggest that statins may cause

myopathy by depleting isoprenoids and interfering with intracellular calcium

signaling. Certain patient and drug characteristics increase risk for statin

myopathy, including higher statin doses, statin cytochrome metabolism, and

polypharmacy. Genetic risk factors have been identified, including a single

nucleotide polymorphism of SLCO1B1. Coenzyme Q10 and vitamin D have been used to

prevent and treat statin myopathy; however, clinical trial evidence demonstrating

their efficacy is limited. Statin-intolerant patients may be successfully treated

with either low-dose statins, alternate-day dosing, or using twice-weekly dosing

with longer half-life statins. An algorithm is presented to assist the clinician

in managing myopathy in patients with dyslipidemia. PMID: 20628837