Low-Glycemic-Index Diet Relieving Migraine but Inducing Muscle Cramps

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Abstract

Low-glycemic-index diet (LGID) has been shown to exhibit a beneficial effect in patients with epilepsy, exercise-induced dyskinesia, writer’s cramp, migraine, and in myopathic mice. A 57-year-old female with classical migraine with and without aura since 14 years of age and a frequency of 8 to 12 attacks per month experienced some relief using a nasal spray of zolmitriptan since 10 years. Occasionally, she developed a status migrainosus lasting up to 5 days. At the age of 57 years, she started an LGID and recognized a significant decline of frequency and intensity of her migraine attacks but also of other abnormalities shortly after starting the diet. After 8 weeks on the LGID muscle cramps of the left calf, which radiated to the thighs, buttocks, and from there to the right leg, accompanied by fasciculations developed. The slight modification of the LGID, naproxen, and novaminsulfon relieved the cramps. LGID may have a beneficial effect on classical migraine but may induce muscle cramps, which require modification of the LGID.

Keywords
- Atkins’ diet
- headache
- ketogenic diet
- migraine
- pain

Introduction

Low-glycemic-index diet (LGID, the Atkins diet) and its modifications are characterized by daily intake of a high fraction of fat and a low fraction of carbohydrates. The Atkins diet has been repeatedly shown to exhibit a beneficial effect on various neurological conditions. LGID has been shown to be particularly effective in various types of mitochondrial epilepsy, exercise-induced dyskinesias, writer’s cramp, and ketogenic myopathy of mice. Here, we report a patient with migraine who significantly profited from the LGID but also experienced side effects.

Case Report

The patient is a 57-year-old female, height 175 cm, weight 68 kg, who developed classical migraine at 14 years of age. Occasionally, migraine was preceded by aura and was previously associated with severe nausea and vomiting. Without taking any medication, migraine attacks lasted 24 hours to 5 days. Aura had become less frequent during the last years and manifested without headache meanwhile. Migraine occurred with a frequency of up to 10 (8–12) attacks per month since 20 years, along with marked changes of the weather as a triggering factor. The patient also experienced episodes of status migrainosus lasting up to 5 days. Initially, migraine was treated with various nonsteroidal analgesic drugs, sumatriptan, and as a prophylaxis, β-blockers, and topiramate with side effects. Since 10 years, the patient was taking zolmitriptan in the form of a nasal spray, metoclopramide, and domperidone with a beneficial effect. Since adolescence she also experienced polyarthralgia. At the age of 42 years, spondylarthritis with permanent enthesitis and bursitis with antibodies against HLA-B27 was diagnosed why hydroxychloroquine and naproxen were prescribed. Since 55 years of age, the patient experienced permanent hypohesias of the feet and transient paresthesias over the right calf or around the left lower leg, several times per week. Since years, she also experienced sudden-onset attacks of fatigue, particularly in the afternoon but sometimes also after getting up in the morning. Since the age of 56 years, she suffered from a medial epicondylitis on the right side. At the
The improvement
In a study of 45 migraine patients on
writer’s cramp, and migraine with aura.
completely under LGID from exercise-induced dyskinesia, 5 years and 10 years, respectively, both recovered almost
achieved compared with the control group. In twins aged
cose transporter-1 deficiency due to a mutation in
of the attacks. A beneficial effect of LGID for migraine has
decline from 10/month to 1/month but also the intensity
achieved compared with the control group. During the first 12 weeks
under LGID, she experienced only three migraine attacks,
which were always associated with a weather change. Further-
more, manifestations of fructose and lactose intolerance markedly improved and attacks of sudden fatigue during the
day and epicondylitis completely resolved since initiation of
the LGID. Eight weeks after starting the LGID, she suddenly
experienced extremely intense muscle cramps of the left
calf visual analogue scale (VAS 8), which radiated to the
thighs, buttocks, and from there to the right leg. She attribut-
ed the muscle cramps to LGID, although she had experienced
occasional cramps of the right calf already since 1.5 years
before LGID. Muscle cramps had started even before as mild
carpopedal spasms bilaterally since the age of 54 years. The
intensity of muscle cramps increased after she had been phys-
ically active during the day. Muscle cramps could be relieved
by sitting. Eight weeks after starting LGID, she first recognized
fasciculations of the buttocks and right calf. She also experi-
cenced spontaneous myalgias, which she described as perma-
nent sore muscles with a maximum in the morning. Nerve
conduction studies of the left-ulnar nerve, right-peroneal
nerve, right-tibial nerve, and right-sural nerve were all nor-
mal. Since L-carnitine and magnesium did not relieve muscle
cramps, she slightly reduced the amount of fat and increased
the carbohydrate portion with some improvement. To further
resolve muscle cramps, she took steroids thrice, novaminsul-
fon and wobenzym, in addition to her drugs against migraine
and spondylarthritides, with a beneficial effect.

**Discussion**

The presented patient is interesting since she experienced marked relief from long-term migraine after application of
the LGID. Not only did the frequency of migraine attacks decline from 10/month to 1/month but also the intensity
of the attacks. A beneficial effect of LGID for migraine has been previously reported in an 8-year-old male with glu-
cose transporter-1 deficiency due to a mutation in SLC2A1. 5 Hemiplegic migraine permanently resolved on adherence
to a modified LGID. 5 In a study of 45 migraine patients on
LGID during 6 months, significant improvement could be
achieved compared with the control group. In twins aged
5 years and 10 years, respectively, both recovered almost
completely under LGID from exercise-induced dyskinesia,
writer’s cramp, and migraine with aura. 2 A beneficial effect
of the Atkins diet on migraine has been first shown in 1928
by Schnabel et al.

LGID is not only beneficial for migraine but also for mito-
chondrial epilepsy, writer’s cramp, exercise-induced dyskine-
sia, 2 and mitochondrial myopathy in mice. 4 The improvement
of epilepsy, following fasting, is known since biblical times
but has been first described by Guelpa and Marie in 1911. The
effect was confirmed by a report by Geyelin in 1921. In a
recent study of nine patients with refractory epilepsy, how-
ever, LGID was effective in only two of them. The reason why
LGID is effective in these disorders remains speculative, but it
can be assumed that it is attributable to the ability of ketone
bodies to enhance the mitochondrial energy metabolism and
to counteract neuronal inflammation. It has been also
hypothesized that ketone bodies could exhibit an inhibitory
effect on neuronal ion channels, reduce neuronal excitabili-
ty by decreasing the cerebral pH, reduce cortical spreading
depression propagation, or shift the amino acid metabolism
such that more inhibitory transmitters are produced. There
are, however, also reports showing that LGID may worsen
gene epilepsy due to a mutation in the SLC13A5 gene. LGID
may also exhibit an immune-enhancing effect in patients
with malignant gliomas.

A further interesting point of the presented case is that
LGID-enhanced muscle cramps. An argument in favor of the
LGID as the trigger of muscle cramps is that steroids, which
increase blood glucose, or reduction of the fat and increase
of the carbohydrate–portion of the LGID relieved muscle
cramps. LGID also improved myalgias. Although the cause of
muscle cramps and sensory disturbances remains unknown,
it can be speculated that together with migraine, they may
have a common cause, such as a mitochondrial defect. Dis-
continuation of chloroquine relieved myalgias and muscle
cramps. Vertebral stenosis, disc prolapse, arteriopathy, or
venous thrombosis were excluded as causes of the cramping.

It is concluded that LGID may significantly reduce inten-
sity and duration of migraine attacks. Most likely, this effect
occurs only in patients in whom migraine is due to a mito-
chondrial defect. In case LGID is effective, defective glucose
metabolism is quite likely.

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None.

**Conflict of Interest**

None declared.

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