

## Information for Patients

### **Caffeine and Migraine**

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#### **Key Points**

1. Caffeine affects pain.
2. Acute treatment of headaches with caffeine is sometimes effective, but should be limited to not more than two days per week.
3. For people who experience migraine, caffeine taken 3 or more days per week, for whatever reason, may lead to dependency and increased migraine frequency.
4. For those who have frequent headaches, avoidance of all caffeine is ideal, and at least until improvement in headache frequency is seen.

Migraine patients often report that a strong cup of coffee can stop some attacks. This is not surprising to hear. Caffeine is a key active ingredient in many headache medications including Excedrin™, Anacin™, MdoI™, Darvon Compound™, Fioricet™, and Migranal™. Caffeine may aid in the body's absorption of these medicines, but can caffeine itself relieve headaches? Few research studies have examined this question, but the answer appears to be yes. Caffeine can provide some headache relief. For example, one small controlled study found that caffeine was better than placebo, and as good as acetaminophen, in relieving tension-type headaches.

So why not just treat your headaches with coffee? Unfortunately, caffeine's effects on the brain can vary tremendously depending upon how often you use it. With occasional use, it may provide modest acute headache relief as well as its characteristic satisfying sense of alertness and well-being. However, with daily or near daily caffeine exposure, the brain may develop a tolerance for the drug. This means, a given dose becomes less effective with repeated use. Dependency develops when the brain expects that an additional dose of caffeine will be coming soon. If that caffeine expectation is unmet, a withdrawal syndrome results which includes headache itself as a prominent symptom, along with fatigue, trouble concentrating, nausea, and other symptoms suggestive of migraine. An example of this withdrawal syndrome may be the "weekend migraine", where attacks tend to occur on Saturdays or Sundays associated with "sleeping in" and delaying the morning cup of coffee.

We don't fully understand the mechanisms underlying the different effects of caffeine on the brain. However, the specific targets of action of caffeine in the brain and nerves outside the brain are known. Caffeine affects the activity of a naturally occurring and necessary brain substance called adenosine. Adenosine levels in the blood go up during migraine attacks. Furthermore, adenosine when injected into a vein can trigger migraine attacks. Adenosine is widely available in the brain and can produce many effects including less brain electrical activity, temporary widening of blood vessels, and control of some aspects of sleep and movement. Adenosine acts by sticking to specific receptor molecules on the surfaces of some brain cells. Caffeine can block the action of these receptors and thereby stop the effects of adenosine. We do not know how these effects of caffeine result in acute anti-migraine and pain control actions.

In daily caffeine users, caffeine has less of an effect on brain action and blood vessel size. Caffeine withdrawal may lead to a significant increase in blood flow in the brain. This is due to an increase in blood vessel size as a result of stretching or dilation. These chronic effects of caffeine are likely a result of changes in the numbers, types and change in function of adenosine receptors active on brain cells. These changes may contribute to caffeine tolerance and dependency.

Caffeine is the world's most popular drug and coffee possibly second most valuable product after oil. Up to 90% of Americans of all ages consume some caffeine daily with more than 50% consuming coffee daily. More than 50% average 300mg per day with an average daily dosage for all consumers of about 200mg. One report estimates nearly 95% of Brazil's population consumes caffeine daily, whereas only about 63% of Canadian adults do so. The average dietary caffeine consumption in some Scandinavian countries is more than 400 mg per person per day. It is not hard to reach 200-300mg of caffeine daily since a standard 8-ounce cup of coffee made by the American drip method contains between 125 and 250mg of caffeine. A 12-ounce can of Coca Cola contains 34mg. Also, the usual 'cup' of coffee for many individuals is often actually 12 or even 16 ounces and sometimes more.

Do not underestimate the power or potency of caffeine. Caffeine dependency can occur after as little as 7 days of exposure. 100mg per day can sustain dependency. In fact, many individuals can avoid caffeine withdrawal symptoms by as little as 25mg - the equivalent of about 2 tablespoons of most "gourmet" coffees. Carefully controlled studies show that caffeine doses as low as about 10mg can be reliably noticed by particularly sensitive people. These studies also show that more than 30 percent of people can feel the effects of 18mg or less.

Is "decaf" coffee OK? According to a US Department of Agriculture rule, 97.5 % of caffeine must be removed from coffee in order for it to be called decaffeinated. Therefore, the starting potency of coffee is very relevant to the final potency of decaf. University of Florida researchers have measured up to 6.9 mg caffeine per 8 oz of Starbucks brewed decaffeinated coffee and up to 15.8 mg caffeine per 1 oz shot of Starbucks decaffeinated espresso. So only a couple of cups of decaf a day might still have a considerable effect on some people.

Studies of caffeine dependency and tolerance show that daily caffeine users are actually more motivated to consume it to avoid withdrawal symptoms, than to experience the lift that its stimulant properties may provide. Caffeine's combination of a punishing syndrome of withdrawal, along with a rewarding sense of wakefulness, has made coffee, tea, and chocolate, some of humanity's best-loved foods. One might say that caffeine-producing plants have succeeded in motivating humans to cultivate them widely and with very great care.

Not everyone consuming daily caffeine is equally likely to develop dependency and withdrawal syndrome. Studies indicate that genetics make some people more likely than others. Scientists do not know whether the inherited tendency to experience caffeine withdrawal syndrome relates to the genetic factors that cause migraine. However, chronic daily headache (CDH) patients are much more likely to use daily dietary caffeine and/or prefer caffeine-containing headache medications. Moreover, people who occasionally experience migraine attacks are at a higher risk of developing CDH when they also consume caffeine daily too. In one study, consumers of 100mg caffeine daily had nearly 3 times higher likelihood of developing CDH than those drinking less. This association is particularly notable for young women - a group already at greater risk for migraine and the march or progression to daily headache.

In summary, caffeine may lead to the development of medication-overuse headache (so-called "rebound" headache). As such, patients should limit caffeine use as recommended for other acute medications for migraine. This use should not exceed two days per week. The unwelcome news is that patients with a history of severe or chronic migraine should consider eliminating caffeine entirely, at least for several months. This typically needs to be done with removal of other overused painkillers and the addition of further preventive management of headache. Removing caffeine alone is rarely enough to solve the problem. For patients with high daily caffeine intake, this reduction in use should be achieved over a gradual taper of days or even weeks to limit the impact of withdrawal syndrome. If you elect removal in a "cold turkey" manner, you may suffer severe migraine attacks which are more difficult to bring under control. Once migraine attacks are no longer frequent, caffeine might be reintroduced, but limited to no more than two days per week, if at all. For some people, it seems that any amount of caffeine can trigger or worsen migraine. A headache log or diary helps to determine if resuming caffeine leads to more headaches.

It is important to emphasize that caffeine consumption is rarely the sole 'cause' of frequent headaches including migraine. However, it is a modifiable risk factor, unlike many other unavoidable migraine triggers. Caffeine is often a significant and overlooked contributor to the problem of frequent and chronic daily headache. Migraine sufferers should use caffeine less frequently or remove it entirely as one component of a program of therapies for success - and it requires no prescription.

