

Use of potassium citrate in restless leg syndrome (RLS)

Abstract

It was an incidental finding that potassium citrate is significantly effective in Restless leg syndrome (RLS). While on use of potassium citrate 1080mg equivalent to 10mEq potassium orally once daily for the prevention of renal calculus in a patient suffering from renal colic it was incidentally observed that it significantly relieved the RLS of the patient.

To evaluate the efficacy of potassium citrate in the treatment of RLS, a study was conducted on 68 patients having moderate to severe RLS. The patients were aged between 30 and 80. It was observed that 37(54.4%) patients were completely relieved from RLS at the end of 15days therapy and 20 (29.4%) patients were relieved after one month and 11(16.1%) were completely relieved after 45days therapy. Extensive methodological study is suggested to further explore the potentiality of potassium citrate in the treatment of RLS, as very few references could be searched out which are consistent with the results of the present study.

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Objective

As it was an incidental finding, the study was conducted to explore the efficacy and probable mechanism of action of potassium citrate in RLS as there were very few studies in this respect.

Introduction

Restless Legs Syndrome (RLS) or Willis-Ekbom's disease is a neurological disorder characterized by an irresistible urge to move one's body to stop uncomfortable or odd sensations. It most commonly affects the legs, but can affect the arms, torso, and even phantom limbs. Moving the affected body part modulates the sensations, providing temporary relief. RLS sensations can most closely be compared to an itching or tickling in the muscles, like "an itch you can't scratch" or an unpleasant "tickle that won't stop". The sensations typically begin or intensify during quiet wakefulness, such as when relaxing, reading, studying or trying to sleep. In addition, most individuals with RLS have limb jerking during sleep, which is an objective physiologic marker of the disorder and is associated with sleep disruption. It is a "spectrum" disease with some people experiencing only a minor disruption of sleep and significant impairments in quality of life.¹

The prevalence of RLS increases with age and appears to be higher among women than among men.²

A family history of RLS is particularly common among patients whose symptoms appear before 40years of age.³

Patients with an onset of symptoms after 50years of age have less familial occurrence of RLS and are more likely to have symptoms or signs of neuropathy.^{3,4} Studies of large kindreds suggest an autosomal dominant mode of inheritance,² and a major susceptibility locus for RLS has been identified on chromosome 12q.⁵

Restless Leg Syndrome (RLS, Nocturnal myoclonus, Akathisia) is a disorder in which there is an urge or need to move the legs to stop unpleasant sensations. RLS occurs most often in middle aged and older adults. Stress makes it worse. The cause is not known in most patients. RLS may occur more often in patients with Chr. Kidney

disease, peripheral neuropathy, pregnancy, DM, iron deficiency, Parkinson's disease, use of caffeine, calcium channel blockers, lithium or neuroleptics and withdrawal from sedatives. RLS is commonly passed down in families. The abnormal gene has not yet been identified. RLS may be described as creeping, crawling, aching, pulling, searing, tingling or bubbling. Most patients have rhythmic leg movements during sleep hours, called periodic limb movement disorder (PLMD).²

Because potassium contributes to muscle function, Restless leg syndrome (RLS) and muscle spasms are symptoms of low potassium in women. Some doctors recommend a potassium supplement to prevent RLS. Low potassium levels are often caused by a magnesium deficiency.⁶

Low potassium contributes to muscle spasm and "restless leg syndrome; because potassium plays a major role in regulating muscle contractions, low potassium levels are associated with muscle twitches and spasms. These include a condition that doctor's call "restless leg syndrome" a condition that often wakes people during the night.⁷ Taking a daily dose of 800-1000mg calcium, 300mg potassium and 500mg of magnesium at bedtime may help reduce RLS symptoms.⁸

The impressive relief from restless legs syndrome (RLS) symptoms provided by levodopa treatment indicates RLS is caused by a dopaminergic abnormality. But similar and more lasting relief also occurs for iron treatment in some patients. Thus there are two major putative causes for RLS: CNS dopaminergic abnormality and CNS iron insufficiency. This article presents the data documenting that both peripheral and CNS iron insufficiency occur with RLS symptoms. Brain iron insufficiency is supported by independently replicated cerebrospinal fluid and brain imaging studies for patients without iron deficiency (ID) anemia.^{9,10}

The secondary forms of RLS strongly support an iron deficiency abnormality for RLS, further documented by several other studies. Some animal studies have shown a relation between iron deficiency and dopaminergic abnormalities that have some similarity to those seen in the RLS patient.^{9,10}

There are no specific tests for RLS but non-specific laboratory tests are used to rule out other causes such as vitamin deficiencies. According to National Institute of Health's National Institute of Neurological Disorder and Stroke, there are four symptoms that are used to confirm the diagnosis.

- Symptoms are more severe at night and do not occur or are negligible in morning.
- An irresistible urge to move the leg or legs often associated with a sensation of tingling, burning, pricking or numbness or other unpleasant and unusual sensations.
- The sensations begin following relaxation and during sleep.
- Temporary relief from these sensations during movement of the affected legs.¹

There is no known cure for restless leg syndrome. Treatment is aimed at reducing stress and helping the muscles relax. Gentle stretching exercises, massage and warm baths may help. Low doses of Pramipexole or Ropinirole can be very effective at controlling symptoms in some people. Sinemet (an anti-parkinson's medication), gabapentin and pregabalin or tranquilizers such as clonazepam may be prescribed. Patients with iron deficiency should receive iron supplements. Low doses of narcotics may sometimes relieve symptoms of RLS.²

Pharmacotherapy involves dopamine agonists or gabapentin enacarbil as first line drugs for daily RLS; and opioids for treatment of resistant cases. Dopamine agonists such as Ropinirole, Pramipexole, Carbidopa/Levodopa or Pergolide. Ropinirole was first approved in 2005 by FDA to treat moderate to severe RLS. Pramipexole received a positive recommendation by the EU Scientific committee in Feb, 2006. Gabapentin enacarbil, a non-dopaminergic treatment for moderate to severe primary RLS was approved by US FDA in April 2011.¹¹ Opioids particularly methadone is a particularly effective treatment for severe RLS and does not have the negative side effects of dopamine agonist. Anticonvulsants such as carbamazepine help people who experience RLS sensations as painful. Quinine is frequently used off label to treat RLS but is not recommended by FDA due to its risk of serious hematological side effects.¹

Very few references could be searched out which are consistent with the present study. The author incidentally observed that it is significantly effective in RLS and therefore conducted the study on 68 patients suffering from moderate to severe RLS.

Materials and method

It was a prospective randomized interventional study conducted on 68 patients (50 female, 18 male) of RLS aged between 30 and 80, attending private outpatient chamber. The diagnosis was done from clinical manifestations, mostly from the characteristics of RLS. Laboratory tests of Hb%, ESR, RBS, Serum electrolytes were also done. The study period was from June 2011 to March 2012. Patients

of DM, Renal diseases, IHD, hypertension, peripheral neuropathy, OA were excluded. Male & female patients aged 30-80 were included.

Verbal consent was taken from all patients explaining the objective and nature of the study. All the patients were prescribed Tab. Potassium citrate (Urokit; SK-F) 1080mg equivalent to 10 mEq potassium, once daily orally after meal for 45days and counseled to take it regularly and to report fortnightly.

The RLS status were measured by using a 100mm Visual Analogue Scale (VAS) and noted on day 0 and thereafter at the end of 15, 30, 45 day follow up period. The patients were asked to show his/her level of RLS on the scale. The RLS score were ranked as No RLS=0, Mild=1-33, Moderate=34-66, Severe=67-100, measured on day 0 (Zero) and subsequently (Figure 1).

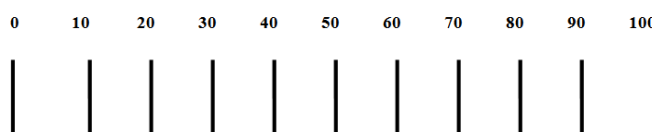


Figure 1 Visual analogue scale (VAS).

Visual analogue scale (VAS)

Visual analogue scale was described by Wall,¹² James & Justins.¹³ In this technique a 100mm (10cm) long scale ranged from 0-100 marks was shown to the patients, where 0 represents no symptoms at all and 100 mark represents worst possible type of symptoms.^{14,15} Patient was explained and was asked to mark the point on the scale where his/her symptoms lies which corresponds to the numerical index of the severity of the symptom.^{11,16}

According to the marking by the patients on the scale, the number of patients were grouped into different levels and recorded.

Results

On 0-day 52 patients (76.4%) shown moderate RLS and the rest 16 patients (23.5%) shown severe level of RLS.

After 15days 37 patients (54.4%) shown no RLS ("0" mark), 20 patients (29.4%) shown mild and the rest 11 patients (16.1%) presented with moderate RLS.

At the end of one month 37+20=57 patients (83.8%) shown no RLS and the rest 11(16.1%) shown mild level of RLS.

At the end of 45days therapy 57+11=68 patients (100%) shown "0" mark in the VAS of RLS (Table 1).

Analyzing the result, it is indicated that RLS responded significantly with 1080 mg Potassium Citrate given daily orally. No significant Electrolyte alteration was observed between pre-treatment and on-treatment. The results are consistent with the few studies on the subject (Figure 2).

Table 1 Number of patients showing level of RLS before and during therapy with potassium citrate

Period	No RLS "0"	Mild RLS(1-33)	Moderate RLS(34-66)	Severe RLS(67-100)
0-Day	0	0	52(76.4%)	16(23.5%)
15-Day	37(54.4%)	20(29.4%)	11(16.1%)	0
30-Day	57(83.8%)	11(16.1%)	0	0
45-Day	68 (100%)	0	0	0

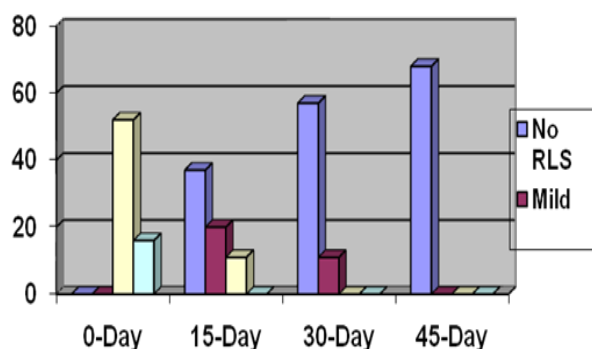


Figure 2 Number of patients showing level of RLS before and during therapy with potassium citrate.

Discussion

Restless Leg Syndrome (RLS, Myoclonus, Akathisia) is a disorder in which there is an urge or need to move the legs to stop unpleasant sensations.² The sensations are difficult to describe: they are not painful but an uncomfortable “itchy”, “Pins & Needles”, or “creepy crawly” feeling deep in the legs.⁸

There are no specific tests for RLS but nonspecific laboratory tests are used to rule out other causes such as vitamin deficiencies. According to National Institute of Neurological disorder and stroke there are four symptoms that are used to confirm the diagnosis.¹

There is no known cure for RLS. Low doses of pramipexole or Ropinirole can be very effective at controlling symptoms in some people. Sinemet, gabapentin and pregabalin or clonazepam may be prescribed. Patients with iron deficiency should receive iron supplements. Low doses of Narcotics may sometimes relieve symptoms of RLS.²

It was an incidental finding that potassium citrate is significantly effective in RLS. While on use of potassium citrate 1080 mg equivalent to 10 mEq potassium (Urokit: SK-F) orally daily for the prevention of renal calculus in a patient suffering from Renal colic, it was incidentally observed that it significantly relieved the RLS of the patient. This observation inspired the author to conduct this study. But very few references could be searched out in net in this respect.

Potassium citrate is a potassium salt of citric acid. As a food additive, potassium citrate is used to regulate acidity. Medicinally, it may be used to control kidney stones derived from uric acid or cystine. It is also used as an alkalinizing agent in mild UTI such as cystitis.⁹ It is rapidly absorbed given by mouth and is excreted in the urine as the carbonate. It is therefore effective in reducing the pain and frequency of urination when these are caused by highly acidic urine.⁵

Potassium citrate is used to treat a kidney stone condition called renal tubular acidosis. Potassium is a mineral that is found in many foods and is needed for several functions of body, especially the beating of heart.⁴

In metabolic acidosis-K citrate 50meq/L is advocated. Citrate is readily oxidized to produce alkaline urine & neutralize acidosis. Oral replacement is the safest method.³

On analyzing the information the beneficial effect of pot-citrate in RLS may be due to

- i. Neutralization of acidosis and or
- ii. Potassium influx into muscle cells thereby hyperpolarizing the

muscles resulting in decreased contraction. More scientific researchers are suggested to exclude or include this hypothesis.^{12,13,17,18}

Conclusion

Though there are very few references in support of the results of this study, potassium citrate is significantly effective in relieving RLS. More scientific researchers are suggested on this issue.

Acknowledgements

None.

Conflict of interest

Author declares that there is no conflict of interest.

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