

AN OVERVIEW OF RENAL DENERVATION THERAPY IN HYPERTENSION TREATMENT

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ABSTRACT

Aim: To study and review the positives and negatives of renal denervation therapy. **Background:** Hypertension is the leading health condition all over the world. According to the World Health Organization, about 1.28 million adults aged 30 to 80 are affected with hypertension worldwide. And in that, less than half of the individuals diagnosed with hypertension are undergoing treatment. In most heart failure patients, hypertension is the most risk factor found, and the patients were taking multiple drug regimens. A specific category of individuals is not so responsive to the medicines so far. In this scenario innovations will help to overcome these conditions. In the modern era of artificial intelligence, it is possible to reduce hypertension with the help of this equipment. This is not an ordinary treatment and does not apply to all hypertensive patients. This type of treatment can be applied to patients with polypharmacy, drug-induced disorders, and patients prone to adverse drug reactions. Numerous studies published in recent years have shown the effectiveness of catheter-based renal denervation treatment in decreasing blood pressure by reducing sympathetic tone. The statement includes; the process of renal denervation therapy, selection of hypertensive patients, mechanism of blood pressure lowering, and expenses. **Result:** Renal denervation therapy will be very helpful in patients with resistant hypertension and hypertensive urgency as per some studies and in the case of patients with hypertension controlled by monotherapy and dual therapy the procedure is not recommended, but they can also undergo these procedures by their interest. **Conclusion:** According to the studies renal denervation therapy is helpful in patients with resistant hypertension and there is a significant reduction in the blood pressure. However, the cost of the treatment will not be acceptable to most of the patients in a country like India. If these facilities are available in government hospitals and at an acceptable cost it will be the most helpful way to reduce resistant hypertension, it can reduce drug-induced diseases and the mortality and morbidity with hypertension can be reduced. according to studies the anti-hypertensive property of renal denervation therapy will last up to 48 months. we can conclude this is a solution for hypertension for resistant hypertensive patients, and those who are having hypertensive urgencies, there is no need to do this procedure in patients with normal or hypertension that is controllable by monotherapy and dual therapies.

KEYWORDS: kidney, hypertension, renal denervation, artificial intelligence, innovations, resistant hypertension, Doctor of pharmacy.

INTRODUCTION

Hypertension is a cardiovascular event characterized by elevated arteriolar blood pressure that is 140/90 and above. And it is the leading risk factor for heart failure. According to the World Health Organization, about 1.28 million adults aged between 30 and 80 have hypertension and only half of this population have undergone diagnosis and treatments, according to a survey organized by the International Society of Hypertension the worldwide prevalence of hypertension among 1.5 million individuals from 92 countries were found to be 34% in the year 2019.

In the case of hypertensive patients, most try to control their blood pressure with anti-hypertensive medications like diuretics, calcium channel blockers, beta-blockers, and others. In some cases, patients are unable to control their blood pressure by monotherapy, which will be continued as polytherapy, which will lead to more complications through these drugs, so here comes the application of renal denervation therapy. In this type of therapy, the main intention is to block the nerve impulses that act on the kidney to increase blood pressure, The procedure is so simple the instrument is inserted into the kidney via small incisions in the main arteries like a catheter and the spiral-shaped or inflated instrument is inserted (Fig 1 & 2). The tip of the instrument is made up

of small leads that can conduct radiofrequency. The central processing unit controls the instrument and it will detect the impulses that will make the blood pressure high. The main objective of the device is to reduce blood pressure without harming the patient. This therapy is mainly used in patients with resistant hypertension. The antihypertensive property of the renal denervation therapy will last up to 48 months after the procedure.



Fig 1: Spiral-shaped renal denervation device.

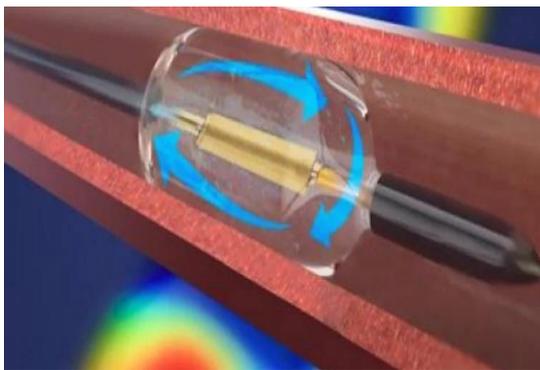


Fig 2: Inflated renal denervation device.

In India renal denervation therapy is practiced in Kerala (Metromed International Cardiac Centre, Calicut) where they have a big success rate. According to their data, a male patient was admitted with resistant hypertension and he was taking 5 to 6 anti-hypertensive medications, so they decided to conduct renal denervation therapy on him. After the procedure, he was in hospital for observation and the results were attractive, They found a reduction in his blood pressure that is there was a reduction of 9 to 12 mm of hg in the blood pressure (the Hindu).

In the case of polypharmacy, there will be possibilities of increased arterial stiffness after 46 months, but in the case of renal denervation therapy, there are no such stiffness-related problems found. The procedure is so simple it can be done in a single day if there is no other complication it is possible to discharge by the same day. The process is mainly done by harmless radio frequencies so there will be no radiation-induced organ damage reported.

Data from the first-generation RDN trials first showed that RDN successfully lowered blood pressure in patients with resistant hypertension. In Thailand, the first study on the effectiveness of RDN in people with resistant hypertension was released in 2014. For up to 9 years, Thai patients' RDN results remained successful. In the post hoc analyses of the SYMPPLICITY HTN-3 trial and meta-analysis, baseline systolic blood pressure was the most effective predictor of BP decreases after RDN. (^{rdn 2}). How blood pressure gets increased in addition to other processes, the sympathetic nervous system's activity contributes to BP increase. The adventitial layer of the renal arteries in humans is lined with sympathetic afferent and efferent nerve fibers. Signals from the kidneys are sent to the hypothalamus by the afferent sympathetic neurons, typically in reaction to renal damage. This causes a rise in central sympathetic outflow and, eventually, an increase in blood pressure. (^{rdn 2}). The kidneys are innervated by the efferent sympathetic nerves that leave the central nervous system. Efferent sympathetic nerves primarily affect the kidneys by increasing renin production, increasing salt reabsorption in the renal tubules, and inducing renal vasoconstriction to reduce blood flow to the kidneys. Therefore, reducing the sympathetic output to the kidneys may lower overall blood pressure. Before the widespread availability of efficient BP-lowering drugs, surgical sympathectomy was performed to decrease BP. This provided evidence in support of the idea that hypertension is linked to a high sympathetic tone. However, when efficient hypertension drugs were developed, such surgery was rendered ineffective since it caused substantial postoperative side effects. Such a treatment, however, resulted in severe postoperative side effects, rendering it ineffective with the development of potent antihypertensive drugs. Researchers have to come up with other methods to denervate the sympathetic nerve fiber surrounding the renal arteries due to the function of renal sympathetic outflow in elevating blood pressure, the architecture of accessible renal sympathetic nerves, and the necessity for a novel treatment for hypertension. It was originally intended for the radiofrequency ablation catheter to provide heat to kill neurons in the adventitial layer of renal arteries. A Peregrine catheter and intravascular ultrasound ablation of the renal nerve were further methods for ablating the renal nerve.

To reduce discomfort, the renal denervation therapy operation is typically carried out while the patient is sedated and given a local anesthetic. The renal artery may typically be effectively reached using a femoral route in clinical studies. Adverse and unexpected post-procedural effects that occur within 30 days of the surgery are uncommon. One patient exhibited renal artery spasms following renal denervation therapy in our group of 18 patients who received the surgery at some Hospital; these spasms were effectively managed with intraarterial nitroglycerine. After renal denervation therapy, there were no long-term problems; the longest

follow-up lasted up to 9 years. In individuals with a poor renal artery architecture, renal denervation therapy should be avoided. The renal denervation therapy would be challenging and would increase the risk of major complications in patients with an aortic aneurysm, a past aortic dissection, a substantially calcified, convoluted abdominal aorta, or any of these conditions. Renal denervation therapy has comparable contraindications to coronary angiography, such as a higher risk of bleeding (bleeding diathesis, thrombocytopenia), pregnancy, severe chronic kidney disease stage, and prior renal intervention (angioplasty, stent implantation).

When it comes to the negative side of therapy, the first and biggest factor is the cost of the treatment in a country like India where people can not afford the big expenditure of procedures so most of the patients won't go for it. It is contraindicated in patients with renal artery stenosis and a secondary cause of hypertension including a glomerular filtrate of 45ml/min, commonly. Saying the therapy is contraindicated in patients with renal artery abnormalities. In some follow-up studies, it is mentioned that the production of epinephrin in both the body and renal was reduced and there is no artery stenosis found. There were some adverse events including one renal artery dissection induced by a guiding catheter before radiofrequency ablation and three pseudoaneurysms in the femoral artery.

CONCLUSION

According to the studies renal denervation therapy is helpful in patients with resistant hypertension and there is a significant reduction in the blood pressure. However, the cost of the treatment will not be acceptable to most of the patients in a country like India. If these facilities are available in government hospitals and at an acceptable cost it will be the most helpful way to reduce resistant hypertension, it can reduce drug-induced diseases and the mortality and morbidity with hypertension can be reduced. According to studies the anti-hypertensive property of renal denervation therapy will last up to 48 months. As far as I'm concerned, the therapy is very much helpful in the reduction of hypertension. Of course, there will be one or other negative side but the weight of the positive side is more.

At last, we can conclude this is a solution for hypertension for resistant hypertensive patients, and those who are having hypertensive urgencies, there is no need to do this procedure in patients with normal or hypertension that is controllable by monotherapy and dual therapies.

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