What is claimed is

1. A catheter adapted to be used in a method for locating or identifying a functional nerve innervating the wall of a blood vessel in a subject, comprising a shaft, wherein the proximal end of said shaft is configured to be connected to an energy source, and the distal end (catheter tip) of said shaft is in the form of a single helix, double helix or multiple prongs having one or more electrodes.

2. The catheter of claim 1, wherein the one or more electrodes are configured to emit energy sufficient to stimulate or ablate a nerve on said vessel.

3. The catheter of any one of claims 1-2, wherein the electrodes may be activated independently of one another.

4. The catheter of any one of claim 1-3, wherein the entire catheter is between 1 and 2 m in length, wherein the catheter tip is between 2 and 8 cm in length, and between 0.5 mm and 10 mm in diameter.

5. The catheter of any one of claims 1-4, wherein the coil of said helix or said prongs are substantially round or flat in shape, and the electrodes are spaced along the length of said coil or prongs, wherein said electrodes are embedded in said coil or prongs, or lie on the surface of said coil or prongs.

6. The catheter of any one of claims 1-5, wherein the electrodes are evenly spaced along the length of said coil at 90° or 120° from each other.

7. The catheter of any one of claims 1-6, wherein the catheter tip is configured to hold a balloon inflatable to fill the space within the coil of said helix or prongs.

8. The catheter of any one of claims 1-7, wherein said prongs are rejoined at the distal end.

9. Use of the catheter of any one of claims 1-8 for locating or identifying a functional nerve innervating the wall of a blood vessel in a subject, comprising the steps of:

   a. Inserting said catheter into said blood vessel and activating the electrodes on the catheter to deliver energy to one or more locations on said vessel wall sufficient to

change one or more physiological parameters associated with the innervation of said vessel by a sympathetic or parasympathetic nerve; and

b. Measuring said one or more physiological parameters after each energy delivery, and determining the change from the corresponding parameters obtained without energy delivery to said vessel;

wherein a lack of change in said physiological parameters in step b indicates the absence of a functional nerve at the location of energy delivery, a significant change in said physiological parameters in step b indicates the presence of a functional nerve at the location of energy delivery, and the direction of change in said physiological parameters in step b determines the nerve to be sympathetic or parasympathetic at the location of energy delivery.

10. The use of claim 9, wherein said vessel is an artery, including a renal artery.

11. The use of any one of claims 9-10, wherein said functional nerve is related to baroreflex.

12. The use of any one of claims 9-11, wherein said location is an area where a nerve has been ablated, wherein a lack of change in said physiological parameters in step b confirms nerve ablation.

13. The use of any one of claims 9-12, wherein said subject is a human or non-human animal.

14. The use of any one of claims 9-13, wherein said physiological parameters are selected from blood pressure, heart rate, cardiac electrical activity, muscle activity, skeletal nerve activity, action potential of cells, pupil response, electromyogram, vascular constriction, and levels of biochemicals selected from epinephrine, norepinephrine, renin-angiotensin II and vasopressin.

15. The use of any one of claims 9-14, wherein said energy is adjustable and consists of one or more of electrical, mechanical, ultrasonic, radiation, optical and thermal energies.

16. The use of any one of claims 9-15, wherein said energy causes nerve stimulation or nerve ablation.

17. The use of any one of claims 9-16, wherein said nerve is a sympathetic or parasympathetic nerve.

18. The use of any one of claims 9-17, wherein the catheter tip is moved in the blood vessel in the following sequence:

(a) turning 90° or less from the anterior wall to the posterior wall of the artery;
(b) turning 90° or less from the posterior wall to the superior wall of the artery; and
(c) turning 90° or less from the superior wall to the inferior wall of the artery.

19. The method of any one of claims 9-18, wherein the energy delivered falls within the following ranges:

(a) voltage of between 2 and 30 volts;
(b) resistance of between 100 and 1000 ohms;
(c) current of between 5 and 40 milliamperes;
(d) time of application between 0.1 and 20 milliseconds.

What is claimed is

1. Use of a catheter in mapping parasympathetic or sympathetic renal nerve for treatment of disease caused by systemic renal nerve hyperactivity, wherein said catheter comprises a shaft, wherein the proximal end of said shaft is configured to be connected to an energy source, and the distal end (catheter tip) of said shaft is in the form of a single helix, double helix or multiple prongs having one or more electrodes; said mapping comprises the steps of:
   a. introducing said catheter into the lumen of a renal artery such that the tip of said catheter contacts a site on the inner renal artery wall;
   b. measuring one or more physiological parameters to obtain baseline measurements before introducing electrical current to the site, said physiological parameters are selected from the group consisting of systolic blood pressure, diastolic blood pressure, mean arterial pressure, and heart rate;
   c. applying electrical stimulation by introducing electrical current to the site via the catheter, wherein said electrical current is controlled to be sufficient to elicit changes in said physiological parameters when there is an underlying nerve at the site; and
   d. measuring said physiological parameters at a specific time interval after each electrical stimulation, wherein an increase of said physiological parameters over the baseline measurements after said electrical stimulation would indicate that a sympathetic renal nerve has been mapped at said site; a decrease of said physiological parameters over the baseline measurements after said electrical stimulation would indicate that a parasympathetic renal nerve has been mapped at said site.

2. The use of a catheter in claim 1, wherein the electrodes may be activated independently of one another.

3. The use of a catheter in any one of claims 1-2, wherein the entire catheter is between 0.5 and 2 m in length, wherein the catheter tip is between 2 and 8 cm in length and between 0.5 mm and 10 mm in diameter.

4. The use of a catheter in any one of claims 1-3, wherein the coil of said helix or said prongs are substantially round or flat in shape, and the electrodes are spaced along the length of said coil or prongs, wherein said electrodes are embedded in said coil or prongs, or lie on the surface of said coil or prongs.

5. The use of a catheter in any one of claims 1-4, wherein the electrodes are evenly spaced along the length of said coil at 90° or 120° from each other.

6. The use of a catheter in any one of claims 1-5, wherein the catheter tip is configured to hold a balloon inflatable to fill the space within the coil of said helix or prongs.

7. The use of a catheter in any one of claims 1-6, wherein said prongs are rejoined at the distal end.

8. The use of a catheter in any one of claims 1-7, wherein said mapping further comprises the step of applying radiofrequency energy through the catheter to the site identified in step (d) for ablation of the underlying nerve to treat disease caused by systemic renal nerve hyperactivity.

9. The use of a catheter in claims 8, wherein said mapping further comprises the repetition of the steps (b) to (d) on the ablated site , wherein a lack of change in said physiological parameters confirms nerve ablation.

10. The use of a catheter in any one of claims 1-9, wherein the catheter tip is moved in the renal artery in the following sequence:
    (a) turning 90° or less from the anterior wall to the posterior wall of the artery;
    (b) turning 90° or less from the posterior wall to the superior wall of the artery; and
    (c) turning 90° or less from the superior wall to the inferior wall of the artery.

11. The use of a catheter in any one of claims 1-10, wherein the electrical current delivered falls within the following ranges:

(a) voltage of between 2 and 30 volts;

(b) resistance of between 100 and 1000 ohms;

(c) current of between 5 and 40 milliamperes;

(d) time of application between 0.1 and 20 milliseconds.