CLAIMS

1. Apparatus for brachytherapy, comprising:

a casing defining a hollow tube configured to carry one or more brachytherapy seeds in a manner allowing delivery of the seeds to a tumor, by pushing the brachytherapy seeds out of a distal end of the casing;

one or more brachytherapy seeds within the casing, for implanting in a patient, wherein the seeds are carrying atoms of a radioactive alpha emitting element for radiotherapy treatment~~, within the casing~~; and

a viscous liquid within the casing, surrounding the one or more seeds, in a manner preventing ~~radiation~~ daughter nuclei from the atoms on the one or more brachytherapy seeds from exiting the casing.

2. The apparatus of claim 1, wherein the casing comprises a needle.

3. The apparatus of claim 1, wherein the viscous liquid comprises glycerine.

4. The apparatus of claim 1, wherein the casing comprises a seed applicator including an elongate tube adapted for insertion into a patient and a stylet within the tube.

5. The apparatus of claim 4, wherein the casing comprises a hub at a proximal end of the elongate tube, wherein the hub has an empty chamber configured to collect excess viscous liquid from the elongate tube when the viscous liquid expands due to heat sterilization.

6. The apparatus of claim 5, wherein a distal end of the hub connecting to the elongate tube has a funnel shape configured to allow viscous liquid from the elongate tube entering the hub to return back to the elongate tube.

7. The apparatus of claim 1, wherein the casing comprises a seed capsule including a needle port on a first end and a piston carrying the one or more brachytherapy seeds on a second end, and wherein movement of the piston urges the one or more brachytherapy seeds into a needle in the needle port.

8. The apparatus of claim 7, wherein the needle port is configured to receive the needle in an orientation such that the one or more brachytherapy seeds enter the needle along with a portion of the viscous liquid.

9. The apparatus of any of claims 1-8, wherein each of the one or more brachytherapy seeds has a length of at least 0.2 centimeters.

10. The apparatus of any of claims 1-9, wherein each of the one or more brachytherapy seeds has a length of at least 0.5 centimeters.

11. The apparatus of any of claims 1-10, wherein each of the one or more brachytherapy seeds comprises a cylindrical tube having an outer diameter of at least 0.3 millimeters.

12. The apparatus of any of claims 1-11, wherein the one or more brachytherapy seeds comprise seeds formed of a conducting material.

13. The apparatus of claim 12, wherein the one or more brachytherapy seeds comprise stainless steel seeds.

14. The apparatus of any of claims 1-13, wherein the one or more brachytherapy seeds are configured to be removed from the patient after a treatment duration.

15. The apparatus of any of claims 1-8, wherein the viscous liquid can withstand sterilization at about 160 degrees Celsius.

~~9~~16. A method of loading a needle with brachytherapy seeds, comprising:

grasping a needle, having a sharp tip for entering tissue, in a manner preventing movement of the needle;

bringing a brachytherapy seed of a length of at least 0.2 centimeters to a point adjacent the tip of the needle; ~~and~~

pushing the brachytherapy seed forward into the needle, through the sharp tip; and

loading a viscous liquid into the needle, through the sharp tip.

~~10~~17. The method of claim ~~9~~16, wherein pushing the brachytherapy seed forward comprises pushing a stylet, which pushes the seed forward into the needle.

~~11~~18. A brachytherapy seed loading device, comprising:

a central chamber storing a brachytherapy seed carrying atoms of a radioactive alpha emitting element, wherein the seed has a length of at least 0.2 centimeters;

a needle port, configured to lock a needle in an orientation such that a sharp tip of the needle is aligned with the brachytherapy seed in the central chamber; and

a piston configured to push the brachytherapy seed into the needle locked in the needle port,

wherein the central chamber additionally stores a viscous liquid, which prevents Radon released by the brachytherapy seed from leaving the loading device.

~~12. The device of claim 11, wherein the central chamber additionally stores a viscous liquid, which prevents Radon released by the brachytherapy seed from leaving the loading device.~~

~~13~~19. The device of claim ~~11~~18, wherein the needle port includes a screw which when fastened locks the needle in the needle port.

~~14~~20. The device of claim ~~11~~18, further comprising a piston screw which when rotated pushes the piston toward the central chamber.

~~15~~21. A brachytherapy seed applicator, comprising:

a non-metallic elongated tube configured for insertion into tissue;

a hub at a proximal end of the tube;

one or more brachytherapy seeds carrying radioactive particles, within the tube; and

a stylet configured to be inserted into the tube and to push the one or more brachytherapy seeds to a distal end of the elongated tube.

~~16~~22. The brachytherapy seed applicator of claim ~~15~~21, wherein the one or more brachytherapy seeds carry alpha-emitting particles.

~~17~~23. The brachytherapy seed applicator of claim 21 ~~15~~, wherein one or more brachytherapy seeds carry Radium ~~seeds~~ radionuclides.

~~18~~24. The brachytherapy seed applicator of claim 21 ~~15~~, wherein the non-metallic elongated tube allows viewing of the one or more brachytherapy seeds in an ultrasound image of the applicator.

~~19~~25. The brachytherapy seed applicator of claim 21 ~~15~~, wherein the non-metallic elongated tube prevents daughter nuclei of the radioactive particles from exiting the non-metallic elongated tube.

2~~6~~0. The brachytherapy seed applicator of claim 21 ~~15~~, wherein the one or more brachytherapy seeds are distanced from a distal tip of the non-metallic elongated tube by at least one centimeter.

27~~1~~. The brachytherapy seed applicator of claim ~~15~~ 21, wherein the non-metallic elongated tube comprises Kapton.

28. The brachytherapy seed applicator of any of claims 21-27, wherein the one or more brachytherapy seeds have a length of at least 0.2 centimeters.

~~22. A stopper for controlling movement of a stylet relative to a brachytherapy needle, comprising:~~

~~a body structure;~~

~~a first connector on the body structure, for grasping a needle hub of the brachytherapy needle;~~

~~a second connector on the body structure, for grasping a stylet hub in a manner preventing the stylet from moving distally; and~~

~~a third connector on the body structure, for grasping the stylet hub in a manner preventing the stylet from moving both proximally and distally.~~

~~23. The stopper of claim 22, wherein the first connector comprises a slot configured to grasp the needle hub.~~

~~24. The stopper of claim 22, wherein the second connector is configured to prevent distal movement of the stylet without preventing proximal movement of the stylet.~~

~~25. The stopper of claim 22, wherein the second and third connectors are configured to grasp the stylet hub at different axial positions relative to the needle.~~

~~26. The stopper of claim 22, wherein the body structure is expandable in a manner changing the axial position at which the second and third connectors grasp the stylet hub.~~

~~27. A method of inserting a brachytherapy seed into body tissue, comprising:~~

~~providing a needle with a brachytherapy seed therein, with a stylet inserted through a proximal end of the needle and with a stopper holding a hub of the stylet in a first connector of the stylet, which prevents both distal and proximal movement of the stylet relative to the needle;~~

~~inserting a tip of the needle into a tumor;~~

~~pushing the hub of the stylet out of the first connector into a second connector, which prevents distal movement of the stylet hub in a different axial position of the stylet hub relative to the needle, than the first connector; and~~

~~removing the stopper, to allow retraction of the needle proximally relative to the stylet, in a manner leaving the seed within the tumor.~~

~~28. A brachytherapy implant, comprising:~~

~~a hollow biocompatible wire;~~

~~at least one tubular seed defining an internal channel, mounted on the hollow biocompatible wire; and~~

~~radioactive particles for radiotherapy treatment placed on the at least one tubular seed.~~

~~29. The implant of claim 28, wherein the hollow biocompatible wire defines an internal channel having a diameter of less than 0.5 millimeters.~~

~~30. The implant of claim 28, wherein the hollow biocompatible wire is not bio-degradable.~~

~~31. The implant of claim 28, wherein the at least one tubular seed is located in the middle of the hollow biocompatible wire, at least 10 millimeters from both ends of the hollow biocompatible wire.~~

~~32. A method of inserting a brachytherapy seed into body tissue, comprising:~~

~~inserting a needle into body tissue through a first point until a tip of the needle exits the tissue at a second point;~~

~~pushing a distal end of a strand carrying one or more brachytherapy seeds out of the distal tip of the needle;~~

~~grasping the distal end of the strand; and~~

~~retrieving the needle proximally from the tissue while grasping the distal end of the strand, so that the one or more brachytherapy seeds remain in the tissue.~~

~~33. The method of claim 32, further comprising pulling the distal end of the strand to adjust a location of the one or more brachytherapy seeds in the tissue.~~

~~34. The method of claim 32, wherein grasping the distal end of the strand comprises grasping with forceps.~~

~~35. The method of claim 32, wherein inserting the needle into body tissue comprises inserting the needle with the strand therein.~~