Claims:

1. A differential dissecting instrument (DDI) for differentially dissecting complex tissue comprising:

a handle, having a central, longitudinal axis;

a distal end of the instrument configured to be pointed at a complex tissue, and a proximal end of the instrument configured to be pointed at a user;

an elongate member having a distal end and a proximal end, the proximal end of the elongate member connected to the handle; and

a differential dissecting member rotatably attached to the distal end of the elongate member, the differential dissecting member having an axis of rotation and comprising:

at least one tissue-engaging surface;

a first torque-point, the first torque-point disposed to a first side of the axis of rotation of the differential dissecting member; and

a mechanism, configured to mechanically rotate the differential dissecting member around the axis of rotation, thereby causing the at least one tissue-engaging surface to move in at least one direction against the complex tissue, the mechanism comprising:

at least one force-transmitting member possessing a distal end and a proximal end, the distal end being attached to the first torque-point of the differential dissecting member; and the proximal end of the at least one force-transmitting member attached to a motive source; and

a second torque-point disposed to a second side of the axis of rotation of the differential dissecting member, providing a counter-torque on the differential dissecting member, wherein the counter-torque is provided by a second force-transmitting member comprising a distal end and a proximal end, the distal end being attached to the second torque-point of the differential dissecting member, forming an opposed pair of force-transmitting members, wherein first and second force-transmitting members of the opposed pair of force-transmitting members each terminate on their respective proximal ends in a respective cam follower on a cam shaft, and a cam follower of the first force-transmitting member and a cam follower of the second force-transmitting member both engage a single cam shaft;

wherein the at least one tissue-engaging surface is configured to selectively engage the complex tissue such that when the differential dissecting member is pressed into the complex tissue, the at least one tissue-engaging surface moves across the complex tissue and the at least one tissue-engaging surface disrupts at least one soft tissue in the complex tissue, but does not disrupt firm tissue in the complex tissue, and

wherein the differential dissecting member, and the mechanism configured to mechanically rotate the differential dissecting member around the axis of rotation that are distal from the cam shaft, form an output shaft and tip assembly, and a compressed compression spring is configured to force the output shaft and the tip assembly toward the distal end of the instrument, such that travel of the output shaft and the tip assembly toward the distal end of the instrument is resisted and thus limited by tension in the opposed pair of force-transmitting members.

2. A DDI as in claim 1, wherein the at least one force-transmitting member is a connecting rod.

3. A DDI as in claim 1, wherein a rotation of the differential dissecting member imparted by the at least one force-transmitting member is counterbalanced by a counter-torque about the axis of rotation.

4. A DDI as in claim 3, wherein the counter-torque about the axis of rotation of the differential dissecting member is supplied by a torsion spring configured to resist the rotation imparted to the differential dissecting member by the at least one force-transmitting member.

5. A DDI as in claim 1, where the at least one force-transmitting member is a tension member.

6. A DDI as in claim 5, wherein a proximal end of the tension member terminates on a cam follower.

7. A DDI as in claim 1, wherein the motive source is a cam shaft driven by a motor.

8. A DDI as in claim 1, wherein a spring is attached to the second torque-point of the differential dissecting member, wherein the spring is configured to resist the rotation imparted to the differential dissecting member by the at least one force-transmitting member.

9. A DDI as in claim 1, wherein the single cam shaft comprises a first eccentric cam configured to engage the cam follower of the first force-transmitting member and a second eccentric cam configured to engage the cam follower of the second force-transmitting member; and wherein the cam shaft possesses a central axis of rotation, and wherein the first eccentric cam and the second eccentric cam are arranged about the central axis of rotation one hundred and eighty degrees from each other, such that when the cam shaft rotates, the cam follower of the first force-transmitting member is most proximal while simultaneously the cam follower of the second force-transmitting member is most distal.

10. A DDI as in claim 5, wherein the tension member is a cable.

11. A DDI as in claim 1, wherein the first and second force-transmitting members are flexible tension members.

12. A DDI as in claim 5, wherein the tension member is formed of a flexible tension member, such as a wire, string, rope, tape, belt, or chain.

13. A DDI as in claim 5, wherein the tension member comprises a single, continuous tension member, such as a loop.

14. A DDI as in claim 13, wherein the single, continuous tension member has a first end and a second end, and where the first end of the single, continuous tension member forms the proximal end of the first force-transmitting member, and where the second end of the single, continuous tension member forms the proximal end of the second force-transmitting member.

15. A DDI as in claim 1, wherein the motive source is a linear actuator.

16. A DDI as in claim 1, wherein a force applied by the compressed compression spring is adjustable to a level below that which damages tissue, such that a proximally directed force further compresses the spring, driving the differential dissecting member assembly proximally, thereby reducing the spring force on and so relaxing the tension members, whereupon the tension members lose tension, such that the differential dissecting member stops rotating even though the cam shaft is still being rotated by the motive force, and so constitutes a force overload safety factor.

17. A DDI as in claim 1, further comprising at least a first overload mechanism configured to respond to a force applied in a proximal direction onto the differential dissecting member such that when the force exceeds at least a first threshold force, the at least first overload mechanism stops rotation of the differential dissecting member.

18. A DDI as in claim 1, further comprising an omnidirectional control switch, accessible from substantially any direction about the long axis of the differential dissecting instrument.

19. A DDI as in claim 1, further comprising at least one overload mechanism configured to, in response to at least a first threshold force, stop rotation of the differential dissecting member when a force exceeding the at least a first threshold force is applied to the differential dissecting member.

20. A DDI as in claim 19, wherein the at least one first overload mechanism is further configured to stop the motive source in response to the force that exceeds the at least a first threshold force.

21. A DDI as in claim 19, wherein at least a second overload mechanism is configured to respond to a force applied in a proximal direction onto the differential dissecting member, such that when the force exceeds at least a second threshold force, the second overload mechanism

withdraws the differential dissecting member proximally away from the complex tissue to be dissected.

22. A DDI as in claim 21, wherein the at least second overload mechanism comprises:

an inner sleeve aligned substantially parallel to the central longitudinal axis of the handle;

an outer sleeve aligned substantially parallel to the central longitudinal axis and shaped such that the inner sleeve can slide inside the outer sleeve in a direction substantially parallel to the longitudinal axis of the handle; and

wherein inner sleeve is configured to slide proximally relative to the outer sleeve to load a spring that resists sliding of the inner sleeve relative to the outer sleeve.

23. A DDI as in Claim 22 further comprising:

a first spring stop affixed to the inner sleeve;

a second spring stop affixed to the outer sleeve; and

a spring positioned between the first spring stop and the second spring stop such that sliding of the inner sleeve relative to the outer sleeve loads the spring between the first spring stop and the second spring stop to resist sliding between the inner and outer sleeve that would further load the spring .

24. A DDI as in claim 23, wherein the spring is a compression spring and proximal sliding of the inner sleeve relative to the outer sleeve compresses the spring.

25. A DDI as in claim 24, wherein the inner sleeve and the outer sleeve are held at a predetermined relative position when no force is applied to the differential dissecting member such that the compression spring is partially compressed to an initial compression by tension in the at least one force-transmitting member, and wherein a force associated with the initial compression establishes the at least first threshold force or the at least second threshold force.

26. A DDI as in claim 25 further comprising a mechanism for adjusting the initial compression and thus the at least first threshold force or the at least second threshold force.

27. A differential dissecting instrument (DDI) for differentially dissecting complex tissue comprising:

a handle;

an elongate member having a distal end and a proximal end, the proximal end connected to the handle;

a differential dissecting member configured to be rotatably attached to the distal end, the differential dissecting member having an axis of rotation and comprising:

at least one tissue-engaging surface; and

a first torque-point and a second torque-point disposed on either side of the differential dissecting member;

a mechanism configured to mechanically rotate the differential dissecting member around the axis of rotation thereby causing the at least one tissue-engaging surface to move in at least one direction against the complex tissue, the mechanism comprising:

at least one force-transmitting member having a distal end attached to the first torque-point of the differential dissecting member and a proximal end attached to a linear oscillator configured to drive the rotation of the differential dissecting member; and

at least one overload mechanism configured to, in response to at least a first threshold force, stop rotation of the differential dissecting member when a force exceeding the at least a first threshold force is applied to the differential dissecting member,

wherein the at least one tissue-engaging surface is configured to selectively engage the complex tissue such that when the differential dissecting member is pressed into the complex tissue, the at least one tissue-engaging surface moves across the complex tissue and the at least one tissue-engaging surface disrupts at least one soft tissue in the complex tissue, but does not disrupt firm tissue in the complex tissue.

28. A differential dissecting instrument (DDI) for differentially dissecting complex tissue comprising:

a handle;

an elongate member having a distal end and a proximal end, the proximal end connected to the handle, and further possessing a central, longitudinal axis; and

a differential dissecting member configured to be rotatably attached to the distal end, the differential dissecting member having an axis of rotation and comprising:

at least one tissue-engaging surface;

a first torque-point and a second torque-point disposed on either side of the differential dissecting member; and

a mechanism configured to mechanically rotate the differential dissecting member around the axis of rotation thereby causing the at least one tissue-engaging surface to move in at least one direction against the complex tissue, the mechanism comprising:

at least one flexible tension member having a distal end attached to the first torque-point of the differential dissecting member and a proximal end attached to a cam follower;

a torque-resisting means operably connected to the differential dissecting member;

a cam shaft associated with the proximal end of the at least one flexible tension member, and configured to engage a cam follower;

a motor operatively associated with the cam shaft such that rotation of the motor turns the cam shaft;

a power source for the motor;

an omnidirectional control switch operatively associated with the motor and the power source, and wherein the omnidirectional control switch is configured to be accessible from substantially any direction;

a tissue-force-limiting spring, operatively associated with, and maintaining a non-zero tension of, the at least one tension member; and

wherein the at least one tissue-engaging surface is configured to selectively engage the complex tissue such that when the differential dissecting member is pressed into the complex tissue, the at least one tissue-engaging surface moves across the complex tissue and the at least one tissue-engaging surface disrupts at least one soft tissue in the complex tissue, but does not disrupt firm tissue in the complex tissue.

29. A differential dissecting instrument (DDI) for differentially dissecting complex tissue comprising:

a handle, having a central, longitudinal axis;

a distal end of the instrument configured to be pointed at the complex tissue, and a proximal end of the instrument configured to be pointed at a user;

an elongate member having a distal end and a proximal end, the proximal end of the elongate member connected to the handle;

a differential dissecting member rotatably attached to the distal end of the elongate member, the differential dissecting member having an axis of rotation and comprising:

at least one tissue-engaging surface; and

a first torque-point, the first torque-point disposed to a first side of the axis of rotation of the differential dissecting member;

a mechanism, configured to mechanically rotate the differential dissecting member around the axis of rotation, thereby causing the at least one tissue-engaging surface to move in at least one direction against the complex tissue, the mechanism comprising at least one force-transmitting member possessing a distal end and a proximal end, the distal end being attached to the first torque-point of the differential dissecting member; and the proximal end of the at least one force-transmitting member attached to a motive source; and

at least one overload mechanism configured to respond to a force applied in a proximal direction onto the differential dissecting member such that when the force exceeds at least a first threshold force, wherein the at least one overload mechanism is configured to stop rotation of the differential dissecting member,

wherein the at least one tissue-engaging surface is configured to selectively engage the complex tissue such that when the differential dissecting member is pressed into the complex tissue, the at least one tissue-engaging surface moves across the complex tissue and the at least one tissue-engaging surface disrupts at least one soft tissue in the complex tissue, but does not disrupt firm tissue in the complex tissue.

30. A DDI as in claim 29, wherein the at least one force-transmitting member is a connecting rod.

31. A DDI as in claim 29, wherein a rotation of the differential dissecting member imparted by the at least one force-transmitting member is counterbalanced by a counter-torque about the axis of rotation.

32. A DDI as in claim 31, wherein the counter-torque about the axis of rotation of the differential dissecting member is supplied by a torsion spring configured to resist the rotation imparted to the differential dissecting member by the at least one force-transmitting member.

33. A DDI as in claim 29, where the at least one force-transmitting member is a tension member.

34. A DDI as in claim 33, wherein a proximal end of the tension member terminates on a cam follower.

35. A DDI as in claim 29, wherein the motive source is a cam shaft driven by a motor.

36. A DDI as in claim 29, wherein the differential dissecting member further comprises a second torque-point disposed to a second side of the axis of rotation of the differential dissecting member, providing a counter-torque on the differential dissecting member.

37. A DDI as in claim 36, wherein a spring is attached to the second torque-point of the differential dissecting member, wherein the spring is configured to resist the rotation imparted to the differential dissecting member by the at least one force-transmitting member.

38. A DDI as in claim 36, wherein the counter-torque is provided by a second force-transmitting member comprising a distal end and a proximal end, the distal end being attached to the second torque-point of the differential dissecting member, forming an opposed pair of force-transmitting members.

39. A DDI as in claim 38, where the first and second force-transmitting members each terminate on their respective proximal ends in a respective cam follower on a cam shaft.

40. A DDI as in claim 39, wherein the cam follower of the first force-transmitting member and the cam follower of the second force-transmitting member both engage a single cam shaft.

41. A DDI as in claim 40, wherein the single cam shaft comprises a first eccentric cam configured to engage the cam follower of the first force-transmitting member and a second eccentric cam configured to engage the cam follower of the second force-transmitting member; and wherein the cam shaft possesses a central axis of rotation, and wherein the first eccentric cam and the second eccentric cam are arranged about the central axis of rotation one hundred and eighty degrees from each other, such that when the cam shaft rotates, the cam follower of the first force-transmitting member is most proximal while simultaneously the cam follower of the second force-transmitting member is most distal.

42. A DDI as in claim 33, wherein the tension member is a cable.

43. A DDI as in claim 38, wherein the opposed pair of force-transmitting members are flexible tension members.

44. A DDI as in claim 33, wherein the tension member is formed of a flexible tension member, such as a wire, string, rope, tape, belt, or chain.

45. A DDI as in claim 33, wherein the tension member comprises a single, continuous tension member, such as a loop.

46. A DDI as in claim 45, wherein the single, continuous tension member has a first end and a second end, and where the first end of the single, continuous tension member forms the proximal end of the at least once force-transmitting member, and where the second end of the single, continuous tension member forms the proximal end of a second force-transmitting member.

47. A DDI as in claim 29, wherein the motive source is a linear actuator.

48. A differential dissecting instrument (DDI) for differentially dissecting complex tissue comprising:

a handle, having a central, longitudinal axis;

a distal end of the instrument configured to be pointed at the complex tissue, and a proximal end of the instrument configured to be pointed at a user;

an elongate member having a distal end and a proximal end, the proximal end of the elongate member connected to the handle;

a differential dissecting member rotatably attached to the distal end of the elongate member, the differential dissecting member having an axis of rotation and comprising:

at least one tissue-engaging surface; and

a first torque-point, the first torque-point disposed to a first side of the axis of rotation of the differential dissecting member;

a mechanism, configured to mechanically rotate the differential dissecting member around the axis of rotation, thereby causing the at least one tissue-engaging surface to move in at least one direction against the complex tissue, the mechanism comprising at least one force-transmitting member possessing a distal end and a proximal end, the distal end being attached to the first torque-point of the differential dissecting member; and the proximal end of the at least one force-transmitting member attached to a motive source; and

at least one overload mechanism configured to, in response to at least a first threshold force, stop rotation of the differential dissecting member when a force exceeding the at least a first threshold force is applied to the differential dissecting member,

wherein the at least one tissue-engaging surface is configured to selectively engage the complex tissue such that when the differential dissecting member is pressed into the complex tissue, the at least one tissue-engaging surface moves across the complex tissue and the at least one tissue-engaging surface disrupts at least one soft tissue in the complex tissue, but does not disrupt firm tissue in the complex tissue.

49. A DDI as in claim 48, wherein the at least one first overload mechanism is further configured to stop the motive source in response to the force that exceeds the at least a first threshold force.

50. A DDI as in claim 48, wherein at least a second overload mechanism is configured to respond to a force applied in a proximal direction onto the differential dissecting member such that when the force exceeds at least a second threshold force, the second overload mechanism withdraws the differential dissecting member proximally away from the complex tissue to be dissected.

51. A DDI as in claim 50, wherein the at least second overload mechanism comprises:

an inner sleeve aligned substantially parallel to the central longitudinal axis of the handle;

an outer sleeve aligned substantially parallel to the central longitudinal axis and shaped such that the inner sleeve can slide inside the outer sleeve in a direction substantially parallel to the longitudinal axis of the handle; and

wherein inner sleeve is configured to slide proximally relative to the outer sleeve to load a spring that resists sliding of the inner sleeve relative to the outer sleeve.

52. A DDI as in claim 51 further comprising:

a first spring stop affixed to the inner sleeve;

a second spring stop affixed to the outer sleeve; and

a spring positioned between the first spring stop and the second spring stop such that sliding of the inner sleeve relative to the outer sleeve loads the spring between the first spring stop and the second spring stop to resist sliding between the inner and outer sleeve that would further load the spring .

53. A DDI as in claim 52, wherein the spring is a compression spring and proximal sliding of the inner sleeve relative to the outer sleeve compresses the spring.

54. A DDI as in claim 53, wherein the inner sleeve and the outer sleeve are held at a predetermined relative position when no force is applied to the differential dissecting member, such that the compression spring is partially compressed to an initial compression by tension in the at least one force-transmitting member, and wherein a force associated with the initial compression establishes the at least first threshold force or the at least second threshold force.

55. A DDI as in claim 54 further comprising a mechanism for adjusting the initial compression and thus the at least first threshold force or the at least second threshold force.