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ARTICULATING STABILIZER ARM WITH DISPOSABLE AND REUSABLE SUBASSEMBLIES

Abstract

A surgical stabilizer arm includes a reusable base portion and a disposable arm portion. The articulating links that enable the arm to be positioned into arbitrary trajectories are included the disposable portion, thus eliminating the need to clean between the links after a surgical procedure. The disposable portion also includes a tool attachment mechanism and a cable. The reusable portion includes a retractor clamping mechanism, a top plate, a T-shaped base post, a main body, a nosepiece, a threaded drawbar, a thrust bearing assembly, and a threaded handle that can extend or retract the drawbar when rotated. The threaded drawbar may include a slot into which an end of the cable can be inserted, which allows tension to be applied to the cable when the handle is rotated to pull the drawbar into the body of the reusable portion and lock the articulating links in place.

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Background/Summary

CROSS REFERENCE TO RELATED APPLICATIONS [0001] This application is a continuation of U.S. application Ser. No. 18/406,806, filed on Jan. 8, 2024, which is a continuation of U.S. application Ser. No. 17/381,315, filed on Jul. 21, 2021, now U.S. Pat. No. 11,864,746. The contents of the aforementioned applications are hereby incorporated by reference in their entirety.

BACKGROUND

[0002] The present disclosure relates in general to an adjustable arm for stabilizing tissues during surgical procedures such as beating heart cardiac surgery, and, more specifically, to a stabilizer arm having reusable and disposable subassemblies.

[0003] During cardiac surgery, a sternal retractor is typically mounted over the patient carrying retractor blades to separate overlying tissues to allow access to a surgical site. The frame of the sternal retractor has been used to support surgical components (e.g., mechanical rakes or tissue retractors) at selected positions, as shown in U.S. Pat. No. 5,772,583, for example. An adjustable stabilizer arm that mounts onto a sternal retractor frame (or onto other fixtures or thoracic access devices) may provide an adjustable intermediate support for holding the surgical component at a desired position.

[0004] The stabilizer arm may be comprised of various articulating links which are disposed between a quick connector at the distal end (for attaching the surgical component) and a mounting clamp at the proximal end (e.g., for attaching to the fixed sternal retractor). The quick connector provides an end adapter which can grasp a tissue manipulator tool such as a retractor rake. The tool (e.g., rake) may typically be disposable after one use, while the stabilizer arm has typically been reusable after being re-sterilized. An example of a commercially available stabilizer arm is the Hercules™ Stabilizing Arm, sold by Terumo Cardiovascular Systems Corporation of Ann Arbor, Michigan. The articulating links of the stabilizer arm are arranged in a lockable column wherein a central tensioning cable is strung through the links. When the cable is partially tensioned (e.g., by rotating a handle), the links move toward each other to interlock via a series of movable ball and socket joints. The column becomes rigid when the central cable is fully tensioned. Releasing the tension (e.g., by counter-rotating the handle) returns the column to the flexible state. In the relaxed state, enough tension may be maintained to weakly remain in position as the column is adjusted to a desired configuration. The ball and socket joints are generally hemispherical so that side-to-side adjustment angles are available over a wide range.

[0005] Significant portions of the hemispherical surfaces are obscured when the links are nested together. In order to re-sterilize at the point of use (e.g., medical facility or hospital), the tension cable must be slackened to spread the links far enough apart from one another in order to clean between links. Thus, the most challenging and time consuming portion of the sterilization process has been the cleaning of the links and the cable between the links. To avoid the associated efforts for sterilization, some stabilizer arms have been marketed as fully disposable. However, a higher cost is incurred when an entire stabilizer arm is discarded and a new unit is consumed for each surgical procedure.

SUMMARY

[0006] The present disclosure provides a stabilizer arm with a reusable base portion and a disposable arm portion. The articulating links that enable the arm to be positioned are part of the disposable portion, thus eliminating the need to clean between the links after a surgical procedure.

The disposable portion includes a mechanism to interface with either a ball-style or shaft-style tool attachment, a cable, a series of articulating links, and a small retaining sleeve or band that is compressed onto the cable at the end of the links. The reusable portion includes a retractor clamping mechanism, a top plate, a T-shaped base post, a main body, a nosepiece, a threaded drawbar, a thrust bearing assembly, and a threaded handle that can extend or retract the drawbar when rotated. The threaded drawbar may include a slot into which an end of the cable can be inserted, which allows tension to be applied to the cable when the handle is rotated to pull the drawbar into the body of the reusable portion.

[0007] More specifically, a primary aspect of the present disclosure provides a stabilizer arm system with first and second subassemblies. The first subassembly (which may be disposable) is comprised of a plurality of articulating links, a tool interface member, and a tension cable. The articulating links each have a central passage, wherein at least some of the adjacent links nest together at slidable mating surfaces adapted for adjustment of the disposable subassembly to a desired trajectory. The tool interface member is disposed at a distal end of the articulating links and is configured to mount a surgical component to be held at a selected position. The tension cable extends through the central passages, wherein a distal end of the tension cable is affixed to the tool interface member, and wherein a proximal end of the tension cable has a radial expansion for retaining the articulating links on the tension cable. The second subassembly (which may be reusable) is comprised of a domed plate, a barrel-shaped main body, a rotator base, a nosepiece, a drawbar, and a handle. The domed plate is configured to be coupled to a fixture, and the domed plate has a hollow dome portion with a top aperture. The barrel-shaped main body has a longitudinal passage, a bottom cavity having a bottom opening and a distal opening, and a cup-shaped flange around the bottom opening configured to nest with an upper surface of the domed portion. The rotator base is disposed in the top aperture and comprises an inverted T-bar captured in the hollow dome, an upper hub rotationally mounted in the bottom cavity, and a deflector surface disposed in the bottom cavity. The nosepiece is slidable in a distal end portion of the longitudinal passage and has a distal surface configured to bear against a proximal end of the articulating links. The nosepiece includes a plunger arm slidably extending into the bottom cavity to slide on the deflector surface of the rotator base. The drawbar is disposed in the longitudinal passage, wherein a distal end of the drawbar has a retainer configured to releasably capture the proximal end of the tension cable. The handle has a distal end disposed in the longitudinal passage and is movably coupled to the drawbar for manually sliding the drawbar in a longitudinal direction to control a tension applied to the tension cable between a partially loaded state and a fully loaded state. When the tension cable is in the partially loaded state then the articulating links are movable at the mating surfaces and the rotator base is movable on the domed plate. When the tension cable is in the fully loaded state then the articulating links are locked at the mating surfaces and the rotator base is locked on the domed plate.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] FIG. **1** is a top view of one example of a conventional sternal retractor system.

[0009] FIG. **2** is a perspective view of a prior art stabilizer arm in a curved configuration.

[0010] FIG. **3** is a perspective view of one embodiment of a stabilizer arm system of the present disclosure.

[0011] FIG. **4** is a perspective view of a disposable portion of the stabilizer arm system of FIG. **3**.

[0012] FIG. **5** is a perspective view of a reusable portion of the stabilizer arm system of FIG. **3**.

[0013] FIG. **6** is a cross-sectional view of the stabilizer arm system of FIG. **3**.

[0014] FIG. **7** is a partial cross-sectional view of the disposable portion of FIG. **4**.

[0015] FIG. **8** is a cross-sectional view of the reusable portion of FIG. **5**.
[0016] FIG. **9** is a perspective view of a barrel-shaped main body.
[0017] FIG. **10** is a cross-sectional view of the barrel-shaped main body.
[0018] FIG. **11** is a perspective view of a nosepiece.
[0019] FIG. **12** is a cross-sectional view of the nosepiece.
[0020] FIG. **13** is a perspective view of a handle.
[0021] FIG. **14** is a cross-sectional view of the handle.
[0022] FIG. **15** is a perspective view of a thrust bearing.
[0023] FIG. **16** is a cross-sectional view of the thrust bearing.
[0024] FIG. **17** is a perspective view of a sleeve bearing for providing smooth operation of the handle.
[0025] FIG. **18** is a cross-sectional view of the sleeve bearing.
[0026] FIG. **19** is a perspective view of a retaining clip for the handle.
[0027] FIG. **20** is a perspective view of a drawbar.
[0028] FIG. **21** is a cross-sectional view of the drawbar.
[0029] FIG. **22** is a perspective view of a domed plate.
[0030] FIG. **23** is a cross-sectional view of the domed plate.
[0031] FIG. **24** is a perspective view of a rotator base.
[0032] FIG. **25** is a cross-sectional view of the rotator base.
[0033] FIG. **26** is a cross-sectional view of the rotator base disposed in the domed plate.
[0034] FIGS. **27** and **28** are cross-sectional views of the nosepiece, rotator base, and domed plate depicting movement between unlocked and locked conditions resulting from the tension cable shifting between a partially loaded state and a fully loaded state.
[0035] FIG. **29** is a perspective view showing interlocking of the tension cable and swage with the drawbar.
[0036] FIG. **30** is a perspective view of the main body with the drawbar installed.
[0037] FIG. **31** is a cross-sectional view of the main body, drawbar, and nosepiece is a position for attaching the disposable subassembly.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0038] FIG. **1** shows a prior art sternal retractor with spaced-apart blades **10** carried by an adjustable frame **11**. A stabilizer arm **12** has a handle **13**, base **14**, articulating section **15**, and quick-connect mount **16**. Base **14** mounts to frame **11**, e.g., by a clamp assembly. A retraction tool **17** is adapted for connecting to mount **16** (e.g., by a ball-style or shaft-style capturing mechanism in which tool **17** can be joined or removed without use of any tools). FIG. **2** shows another embodiment of a stabilizer arm **20** with articulating links **21**, handle **22**, quick-connect mount **23**, and a base **24** for clamping to a fixture. A tension cable (not shown) may extend from a proximal end of the stabilizing arm (e.g., from the base or handle) to the distal end (e.g., the quick-connect mount or any other type of fixed final link in the adjustable linkage). A solid metal cable, stranded cable, or a fiber resin can be used. An internal mechanism may adjust tension in the cable in response to rotation of handles **13** or **22**. The articulating section may have a plurality of nested, semi-spherical links which can be rotated within one another in order to provide bends in the direction in which the articulating section extends. When the cable is sufficiently slack (i.e., under gentle tension), the links are slidable but when the cable is tightened then the links bind together and the articulating section and an attached tool retain a desired orientation. Most of the component parts of arms **12** or **20** may be comprised of metal, resin, or other materials capable of being re-sterilized and reusable.
[0039] To avoid the challenging re-sterilization of the articulating section without incurring the extra costs of disposing of a complete stabilizer arm, a combination disposable/reusable stabilizer arm **25** shown in FIG. **3** includes a disposable subassembly **26** as shown in FIG. **4** and a reusable subassembly **27** as shown in FIG. **5**.

[0040] As shown in FIGS. **6** and **7**, disposable portion **26** includes a tension cable **30**, a tool interface member **31**, a plurality of articulating links **32**, a primary swage band **33**, and a secondary swage band **34**. Articulating links **32** in this embodiment include ball links **35** which are spherically-shaped and cup links **36** which are cylindrically-shaped with hemispherical indents at both ends. A first ball link **35**A at a proximal end of links **32** and primary swage band **33** are configured to interface with reusable portion **27** as will be described below. Links **32** of disposable portion **26** could have other types of various shapes, provided that the arm can be articulated at the interfaces between adjacent link in order to enable the arm to be positioned at a variety of angles to best suit the surgical needs. A final ball link **351** at a distal end of links **32** is configured to interface with tool interface member **31**. A distal end of tension cable **30** is fixed to tool interface member **31**. All of links **32** have a respective central passage or hole through them for cable **30** to pass through. When links **32** are stacked along the cable alternating between the two shapes (e.g., alternating convex and concave spherical sections), the interfaces between each link form an articulating joint. To provide space for articulation, the concave portions of cup links **36** are less than hemispherical in the illustrated embodiment.
[0041] Tension cable **30** is an elongated cylindrical body. The proximal end of tension cable **30** that connects to reusable portion **27** has one or more radial expansions which function to retain articulating links **32** on tension cable **30** and/or to enable cable **30** to be grasped by a retainer in reusable portion **27**. A single radial expansion can be used to simultaneously provide both functions. For example, primary swage band **33** (i.e., a ferrule or collet) can be fixed onto the proximal end of cable **30** (e.g., by crimping, adhesive, or welding) without using a secondary swage band, whereby swage band **33** attaches to reusable portion **27** and keeps links **32** from falling off cable **30** prior to being attached to reusable portion **27**. If present, secondary swage band **34** is disposed closer to links **32** so that the potential spreading apart of links **32** is more limited (keeping links **32** more organized and improving usability since links **32** would be prevented from sliding too close to the connection point). In some embodiments, a selectively releasable connection between cable **30** and reusable portion **27** can be achieved in a manner without a radial extension (e.g., using a chuck or clamp in reusable portion **27**). In that case, secondary swage band **34** may be used without primary swage band **33**.
[0042] Tool interface member **31**, which is disposed at the distal end of articulating links **32**, is configured to mount a surgical component to be held by stabilizer arm **25** at a selected position. The present disclosure may employ any type of coupling mechanism (such as a quick connect coupling as known in the art using a ball-style and/or a shaft-style attachment) to hold the surgical device. As shown in FIGS. **3-7**, tool interface member may be comprised of a proximal bowl-like surface to receive final link **351** on one side, a thinner middle section or cylinder that can be crimped onto the distal end of cable **30**, and a cylindrical distal section with an axial bore into which the shaft of a surgical component (e.g., a tissue retractor) can be inserted. The surgical component may be retained by crimping, welding, adhesive, or other means.
[0043] Disposable subassembly **26** is adapted for being assembled, sterilized, and packaged as a unit which remains together and is capable of easy handling by the end user. Segregating the articulating links into a subassembly separate from the more complex and costly portions of the stabilizer arm enables an end user to eliminate the cleaning process for the link/cable portion of the device, while maintaining most of the available cost savings by adapting a reusable subassembly to easily couple and uncouple the link/cable portion.
[0044] As shown in FIGS. **6** and **8**, reusable portion **27** includes a domed plate **40** having a clamping end **41** to mount onto a fixture (e.g., a sternal retractor) and having a hollow domed portion **42**. A barrel-shaped main body **43** is held on domed portion **42** by a rotator base **44**. A slidable nosepiece **45** with a concave (hemispherical) distal surface **46** is configured to bear against a proximal end of articulating links **32** (e.g., by receiving ball link **35**A). A drawbar **47** is disposed within main body **43** and nosepiece **45**. Drawbar **47** has a retainer **48** configured to releasably

capture the proximal end of tension cable **30**. A handle **50** has a distal end disposed within main body **43** and is movably coupled to drawbar **47** for manually sliding drawbar **47** in a longitudinal direction to control a tension applied to tension cable **30** between a partially loaded state and a fully loaded state. In the partially loaded state, articulating links **32** are movable at their mating surfaces and rotator base **44** is movable on domed portion **42** of domed plate **40**. As explained later, an upper portion of reusable subassembly **27** can move with two degrees of freedom while in the partially loaded state for adjusting the orientation of the proximal portion of articulating links **32**. When tension cable **30** is in the fully loaded state then articulating links **32** are locked at their mating surfaces and rotator base **44** is locked at a fixed position on domed portion **42**.

[0045] As shown in greater detail in FIGS. **20** and **21**, drawbar **47** is partially flattened and has a slot **51** for forming retainer **48** which has a diameter adapted to receive primary swage band **33**. A radial notch **52** is provided at the distal end of slot **51** for passing through cable **30**. A proximal end of drawbar **47** is threaded for rotation in a threaded passage **53** in handle **50**.

[0046] Main body **43** is shown in greater detail in FIGS. **9** and **10**. Main body **43** is barrel-shaped around a longitudinal passage **55** with a handle section **55**A, a drawbar section **55**B, and a nosepiece section **55**C. Main body **43** further defines a bottom cavity **56** with a bottom opening **57** and a distal opening **58**. A cup-shaped flange **60** around bottom opening **57** has a spherical contour which is configured to nest with an upper surface of domed portion **42**. Handle section **55**A of passage **55** includes an annular groove **61** for receiving a retaining ring **63** (FIG. **19**) and a shoulder **62** for receiving a thrust bearing **64** (FIGS. **15** and **16**) for mounting handle **50** for easy rotation. Nosepiece section **55**C at the distal end of main body **43** includes holes **65** and **66** for mounting a pair of dowel pins **67** and **68** (e.g., by press fit) to project into section **55**C to slidably retain nosepiece **45**.

[0047] Nosepiece **45** is shown in greater detail in FIGS. **11** and **12**. A guide slot **70** on a side of nosepiece **45** is aligned with hole **65** in main body **43** when pin **67** is fitted in hole **65**, which slidably retains nosepiece **45** in nosepiece section **55**C (an equivalent slot is present on the opposite side of nosepiece **45** for receiving pin **68**). Nosepiece **45** has a central passage **71** which has a generally circular cross section except for a flattened side **72**. Passage **71** receives the unthreaded portion of drawbar **47** such that their mutually flattened sides prevent rotation of drawbar **47**. More generally, shapes of passage **71** and the section of drawbar **47** received in passage **71** are keyed (e.g. having complementary cross sectional shapes) to limit rotation of drawbar **47** in passage **71**. Nosepiece **45** has a plunger arm **73** extending in a proximal direction which is configured to project into bottom cavity **56** by a variable amount as nosepiece slides forward and backward in section **55**C. Plunger arm **73** may have a slanted end **74** for deflecting rotator base **44** as described below.

[0048] Handle **50** is shown in greater detail in FIGS. **13** and **14**. A distal-shaft end **75** extends into handle section **55**A, and a gripper end **76** is exposed for being manually rotated. A threaded bore **77** receives the threaded end of drawbar **47**. A radial flange **78** on shaft end **75** creates an annular groove **79** which receives retaining ring **63** (FIG. **19**) to prevent handle **50** from falling off of main body **43**. Handle **50** has a distal surface **80** for contacting thrust bearing **64**. As shown in FIGS. **15** and **16**, thrust bearing **64** may include a race **81** which helps ensure smooth rotation of handle **50**. A cylindrical sleeve bearing **82** (e.g., comprised of nylon) is disposed in a gap between flange **78** and thrust bearing **64** to align handle **50** and provide smooth rotation.

[0049] Domed plate **40** is shown in greater detail in FIGS. **22** and **23**. Hollow domed portion **42** has a shell-shape with a top aperture **83**. An inner recess **84** of hollow domed portion **42** has a cylindrical side wall **85** and a flat upper surface **86**.

[0050] Rotator base **44** is disposed in top aperture **83** to provide a linkage between domed plate **40** and main body **43** via nosepiece **45**. As shown in FIGS. **24** and **25**, rotator base comprises an inverted-T bar **87** coupled to an upper hub **88** by a shaft section **89**. Hub **88** defines a pocket **90** and a deflector surface **91**. Pocket **90** is configured to receive plunger arm **73**. During assembly, rotator base **44** is inserted through top aperture **83** so that hub **88** is received through bottom opening **57** into bottom cavity **56** while inverted-T bar **87** is retained in recess **84**. Hub **88** and bottom cavity **56** may have keyed profiles (e.g., partially circular with a flattened side) so that hub **88** can only be inserted in a proper orientation. Inverted-T bar **87** has the shape of a cylindrical beam which can rotate within recess **84** around a vertical axis **92** (the axis transverse to flat surface **86**) and can rotate (e.g., tilt) forward and backward around a horizontal axis **93** (the axis that is parallel to a longitudinal axis of the cylindrical beam). Domed portion **42** has an upper surface with a convex spherical shape and flange **60** of main body **43** has a concave spherical surface to facilitate the rotation having two degrees of freedom shown in FIG. **26**. Since rotator base **44** can tilt forward-to-back but not side-to-side (i.e., since flat upper surface **86** prevents rotation of rotator base **44** around an axis perpendicular to inverted-T bar **87**), a third degree of freedom is blocked.

[0051] FIGS. **27** and **28** illustrate relative movement among domed plate **40**, rotator base **44**, and nosepiece **45**. FIG. **27** corresponds to a partially-loaded state of the tension cable in which the articulating links are movable at their mating surfaces and rotator base **44** is movable on hollow dome portion **42**. FIG. **28** corresponds to a fully-loaded state of the tension cable in which the articulating links are locked at the mating surfaces and rotator base **44** is locked on the hollow dome portion **42**. With only gentle tension in the tension cable while in the partially-loaded state, the articulating links are weakly pulled against concave distal surface **46** of nosepiece **45**. The slight tension retracts nosepiece **45** in the proximal direction by an amount sufficient to urge rotator base **44** gently upward (via action between slanted end **74** of plunger arm **73** and deflector surface **91**) so that light pressure between inverted-T bar **87** and flat upper surface **86** is generated to loosely hold subassemblies **26** and **27** at whatever configuration the user places them in. When drawbar **47** is retracted in response to manual turning of handle **50**, the articulating links are drawn against surface **46** so that nosepiece **45** retracts in the direction of arrow **95**. As slanted end **74** pushes against deflector surface **91**, rotator base **44** rises vertically in the direction of arrow **95** resulting in greater pressure between inverted-T bar **87** and flat upper surface **86** while simultaneously compressing cup-shaped flange **60** against hollow domed portion **42** to lock the components of reusable subassembly **27** into place. Preferably, slanted end **74** has a shape complementary with deflector surface **91** to provide smooth motion. By design, the locking in place of the components in subassembly **27** occurs at the same cable tension that locks the articulated links in place.

[0052] Interconnection of a disposable subassembly with a reusable subassembly will be explained in connection with FIGS. **29-31**. Because of the flattened sides of drawbar **47** and passage **71** of nosepiece **45**, slot **51** is open toward the top of the reusable subassembly. The handle is rotated in a direction that causes drawbar **47** to extend in a forward (distal) direction so that slot **51** protrudes beyond the distal end of nosepiece **45** (e.g., FIG. **31**). The flattened surfaces prevent rotation of drawbar **47** so that rotation of the handle translates into longitudinal movement of drawbar **47**. With slot **51** exposed, swage band **33** on the proximal end of tension cable **30** of the disposable subassembly is inserted into slot **51**. Cable **30** passes through notch **52**, but swage band **33** is captured in the longitudinal direction because it is larger than notch **52** (the center axis of the tension cable is aligned with a center axis of the drawbar). The handle is rotated in the opposite direction to retract drawbar **47** so that swage band **33** become entrapped in slot **51**. With further rotation of the handle, a tension is eventually applied to tension cable **30** once first link **35**A of the articulating arm contacts bowl-like surface **46** of nosepiece **45**. This movement is what enables the device to lock and unlock the position of the links and the parts of the reusable portion.

[0053] Conventional reusable stabilizer arms require the entire device to be cleaned and sterilized between each use. Difficult cleaning between the links is avoided in the present disclosure by modifying a stabilizer arm into two separate subassemblies which can be coupled and uncoupled easily with no tools, wherein a portion having the cable and links is disposable (eliminating the need to carefully clean between the links). Instead, users would be able to simply remove the entire link subassembly from the device and dispose of it. The installation process for the disposable portion is simply inserting a sleeve or swage at the end of the cable into a slot of the drawbar and tightening the handle. Later, it can be removed by loosening the handle and lifting the sleeve out of the drawbar. This cuts down on the amount of work required to reprocess the device before the next procedure. Additionally, this type of modular system is adaptable to multiple styles of arm (e.g., with different lengths, link shapes, etc.) that can all be created to work with the same reusable base portion, thereby enabling better customization for users to select the arm/attachment combinations that best suits their needs.

[0054] Conventional stabilizer arms have a base which be adjusted to rotate the main body 360° around a vertical axis, but cannot be tilted forward or backward. The present disclosure adds a second degree of freedom to the connection between the top plate and the main body, improving the ability of the device to be positioned according to the needs of the surgeon.

Claims

1. A stabilizer arm system for surgical use, the stabilizer arm system comprising: a disposable assembly comprising a proximal end and a distal end, the disposable assembly comprising: a plurality of articulating links comprising a proximal link, a distal link, and a plurality of adjacent links between the proximal link and the distal link, each link of the plurality of articulating links comprising a central passage, wherein the adjacent links are slidably coupled at mating surfaces; a tool interface member at the distal end of the disposable assembly, the tool interface member comprising a proximal end coupled to the distal link and a distal end configured to receive a surgical component; and a tension cable extending through the central passages of the plurality of articulating links and comprising a proximal end extending proximally from the proximal link and a distal end coupled to the tool interface member; and a reusable assembly configured to releasably couple to the proximal end of the disposable assembly, the reusable assembly comprising: a main body comprising a longitudinal passage; a nosepiece disposed in a distal end portion of the longitudinal passage of the main body, the nosepiece comprising a bore and a distal surface configured to bear against the proximal link of the plurality of articulating links; a drawbar disposed within the longitudinal passage of the main body and extending into the bore of the nosepiece, the drawbar comprising a distal end comprising a retainer configured to releasably couple to the proximal end of the tension cable; and a handle comprising a distal end disposed in the longitudinal passage and movably coupled to the drawbar for moving the drawbar in a longitudinal direction to control a tension applied to the tension cable.

2. The stabilizer arm system of claim 1, wherein the proximal end of the tension cable comprises a first radial expansion configured to retain the plurality of articulating links to the tension cable.

3. The stabilizer arm system of claim 2, wherein the proximal end of the tension cable comprises a second radial expansion spaced from and proximal to the first radial expansion, wherein the second radial expansion is disposed within the retainer of the drawbar when the disposable assembly is coupled to the reusable assembly.

4. The stabilizer arm system of claim 3, wherein the retainer comprises a notch formed in the distal end of the drawbar and a slot extending from the notch and sized to receive the second radial expansion of the tension cable.

5. The stabilizer arm system of claim 1, wherein the handle is configured to rotate to move the drawbar in the longitudinal direction to control the tension applied to the tension cable between a partially loaded state and a fully loaded state.

6. The stabilizer arm system of claim 5, wherein the reusable assembly comprises a plate configured to be coupled to a fixture.

7. The stabilizer arm system of claim 6, wherein the main body comprises a bottom cavity with a bottom opening, the bottom cavity of comprises a cup-shaped flange configured to nest with an upper surface of the plate.

8. The stabilizer arm system of claim 7, wherein the reusable assembly comprises a rotator base comprising: an inverted T-bar captured in a hollow portion of the plate; an upper hub rotationally mounted in the bottom cavity of the plate; and a deflector surface disposed in the bottom cavity of the plate.
9. The stabilizer arm system of claim 8, wherein the stabilizer arm system is configured such that when the tension cable is in the partially loaded state, the plurality of articulating links are movable at the mating surfaces between the adjacent links and the rotator base is movable on the plate.
10. The stabilizer arm system of claim 8, wherein the stabilizer arm system is configured such that when the tension cable is in the fully loaded state, the plurality of articulating links are locked at the mating surfaces and the rotator base is locked on the plate.
11. The stabilizer arm system of claim 1, wherein the tool interface member comprises a quick connect coupling mechanism for holding the surgical component.
12. A disposable assembly of a stabilizer arm system, the disposable assembly comprising: a proximal end and a distal end; a plurality of articulating links comprising a proximal link, a distal link, and a plurality of adjacent links between the proximal link and the distal link, each link of the plurality of articulating links comprising a central passage, wherein the adjacent links are slidably coupled at mating surfaces; a tool interface member at the distal end of the disposable assembly, the tool interface member comprising a proximal end coupled to the distal link and a distal end comprising a quick connect coupling mechanism for holding a surgical component; and a tension cable extending through the central passages of the plurality of articulating links and comprising a proximal end extending proximally from the proximal link and a distal end coupled to the tool interface member, wherein the proximal end of the tension cable comprises a radial expansion configured to releasably couple to a retainer of a reusable assembly of the stabilizer arm system.
13. The disposable assembly of claim 12, wherein the proximal end of the tension cable comprises a second radial expansion distal to the radial expansion, wherein the second radial expansion is configured to retain the plurality of articulating links to the tension cable.
14. The disposable assembly of claim 12, wherein the tool interface member includes a proximal bowl-shaped surface, a thinner middle section, and a cylindrical distal section with an axial bore for crimping onto the distal end of the tension cable and inserting a shaft of a surgical component.
15. The disposable assembly of claim 14, wherein the quick connect coupling mechanism comprises a ball coupling.
16. The disposable assembly of claim 14, where the quick connect coupling mechanism comprises a shaft coupling.
17. A stabilizer arm system for surgical use, the stabilizer arm system comprising: a disposable assembly comprising a proximal end and a distal end, the disposable assembly comprising: a plurality of articulating links comprising a proximal link, a distal link, and a plurality of adjacent links between the proximal link and the distal link, each link of the plurality of articulating links comprising a central passage, wherein the adjacent links are slidably coupled at mating surfaces; a tool interface member at the distal end of the disposable assembly, the tool interface member comprising a proximal end coupled to the distal link and a distal end configured to receive a surgical component; and a tension cable extending through the central passages of the plurality of articulating links and comprising a proximal end extending proximally from the proximal link and a distal end coupled to the tool interface member; and a reusable assembly configured to releasably couple to the proximal end of the disposable assembly, the reusable assembly comprising: a main body comprising a longitudinal passage; a nosepiece disposed in a distal end portion of the longitudinal passage of the main body, the nosepiece comprising a bore and a distal surface configured to bear against the proximal link of the plurality of articulating links; a drawbar disposed within the longitudinal passage of the main body and extending into the bore of the nosepiece, the drawbar comprising a distal end comprising a retainer configured to releasably couple to the proximal end of the tension cable, the retainer comprising a notch formed in the distal

end of the drawbar and a slot extending from the notch and sized to releasably capture the proximal end of the tension cable; and a handle comprising a distal end disposed in the longitudinal passage and movably coupled to the drawbar for moving the drawbar in a longitudinal direction to control a tension applied to the tension cable between a partially loaded state and a fully loaded state.

18. The stabilizer arm system of claim 17, wherein the stabilizer arm system is configured such that when the disposable assembly is coupled to the reusable assembly, the tension cable extends through the notch and a radial expansion of the proximal end of the tension cable is disposed inside the slot, wherein the notch has a diameter smaller than an outer diameter of the radial expansion.

19. The stabilizer arm system of claim 18, wherein the proximal end of the tension cable has a second radial expansion for retaining the plurality of articulating links on the tension cable.

20. The stabilizer arm system of claim 17, wherein the reusable assembly comprises: a plate comprising an upper surface and a bottom surface configured to be coupled to a fixture; a rotator base comprising: an inverted T-bar captured in a hollow portion of the plate; and an upper hub rotationally mounted in a bottom cavity of the plate, wherein the main body comprises a bottom cavity with a bottom opening, the bottom cavity configured to nest with the upper surface of the plate, wherein the stabilizer arm system is configured such that when the tension cable is in the partially loaded state the plurality of articulating links are movable at the mating surfaces between the adjacent links and the rotator base is movable on the plate, and when the tension cable is in the fully loaded state the plurality of articulating links are locked at the mating surfaces and the rotator base is locked on the plate.