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SURGICAL TRACTION BOOT HAVING RESILIENT HEEL PAD AND MEDIAL AND LATERAL STRAPS

Abstract

A surgical boot apparatus for use in surgery involving hip distraction includes a boot shell having a sole portion configured for placement adjacent a sole of a foot of a patient and a calf portion configured for placement adjacent a calf of the patient. Ladder straps are coupled to the boot shell. An instep pad has ratchet buckles to interface with the respective ladder straps. The ratchet buckles are operable to tighten the instep pad against the patient's leg when the patient's leg is situated within the boot shell.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATIONS [0001] This application is a continuation of U.S. patent application Ser. No. 17/952,472, filed Sep. 26, 2022, now issued as U.S. Pat. No. _____, which claims priority under 35 U.S.C. § 119 (e) to U.S. Provisional Application No. 63/277,256, filed Nov. 9, 2021, both of which are expressly incorporated by reference herein.

BACKGROUND

[0002] The present disclosure is related to a support apparatus for supporting a patient. More particularly, the present disclosure relates to a surgical boot apparatus for use in surgery involving hip distraction.

[0003] Often, when a patient is sedated for a surgery, the patient is supported by and secured to braces or supports coupled to a surgical table. Sometimes, unique supports are provided for a patient's extremities such as arm boards, leg supports, hand boards, stirrups, and boots. Supports known in the art sometimes secure patients to resist patient movement. Such supports can sometimes allow excessive patient movement relative to the supports. The position and orientation of supports is often adjusted during surgery to improve access to a surgical site or to move portions of the patient's body such as bones, muscles, tendons, and ligaments to evaluate the surgical results.

SUMMARY

[0004] The present disclosure includes one or more of the features recited in the appended claims and/or the following features which, alone or in any combination, may comprise patentable subject matter.

[0005] According to a first aspect of the disclosed embodiments, a surgical boot apparatus for use in surgery involving hip distraction includes a boot shell having a sole portion configured for placement adjacent a sole of a foot of a patient and a calf portion configured for placement adjacent a calf of the patient. The boot shell has a heel-receiving opening located between the sole portion and the calf portion and configured for receipt of a heel of the patient. The calf portion of the boot shell has a plug-receiving opening spaced from the heel-receiving opening. A resilient pad is provided having a main portion configured for engaging an Achilles area of the patient and a plug extending from the main portion. The plug is configured for press fitting into the plug-receiving opening of the boot shell to attach the resilient pad to the boot shell. The main portion includes an end region that extends into the heel-receiving opening. The end region has an end edge that includes a notch configured for receipt of a calcaneus of the patient.

[0006] In some embodiments of the first aspect, the plug of the resilient pad may be formed integrally with the main portion. The resilient pad may be made of silicone rubber.

[0007] Optionally, in the first aspect, the heel-receiving opening may be defined, in part, by a U-shaped edge of the calf portion of the boot shell. The resilient pad may include a U-shaped lip having a groove that receives the U-shaped edge of the calf portion. The U-shaped lip may be formed integrally with the main portion. The plug-receiving opening may be a triangular opening with rounded corners. A periphery of the plug may be triangular with rounded corners. The plug-receiving opening may be defined by an opening edge and the plug may have a peripheral wall formed with a groove that receives the opening edge. The heel-receiving opening and the plug receiving opening may be both centered on a longitudinal axis of the calf portion of the boot shell.

[0008] It may be desired, in the first aspect, that a first medial strap may be attached to the boot

shell and a first lateral strap may be attached to the boot shell. An instep pad may have a first medial buckle configured for attachment to the first medial strap and a first lateral buckle configured for attachment to the first lateral strap. The first medial strap and the first lateral strap may each include a ladder strap. The ladder straps of the first medial strap and the first lateral strap may be of substantially equivalent lengths. The first medial buckle and the first lateral buckle may each include a ratchet buckle through which the respective ladder straps ratchet.

[0009] It may be contemplated, in the first aspect, that a second medial strap may be attached to the boot shell and a second lateral strap may be attached to the boot shell. The instep pad may further include a second medial buckle configured for attachment to the second medial strap and a second lateral buckle configured for attachment to the second lateral strap. The first medial strap, the first lateral strap, the second medial strap, and the second lateral strap may each include a ladder strap. The ladder straps of the second medial strap and the second lateral strap may be of substantially equivalent lengths. The ladder straps of the first medial strap, the second medial strap, the first lateral strap, and the second lateral strap may be of substantially equivalent lengths. The second medial buckle and the second lateral buckle may each be ratchet buckles through which the ladder straps of the second medial strap and the second lateral strap ratchet. Proximal ends of the first medial strap and the first lateral strap may be attached to the calf portion of the boot shell. Proximal ends of the second medial strap and the second lateral strap may be attached to a junction region of the boot shell where the sole portion and calf portion meet.

[0010] In some embodiments of the first aspect, the instep pad may have a first pocket situated between the first medial buckle and the first lateral buckle. The first pocket may have open sides. Distal ends of the first medial strap and the first lateral strap may be insertable into the first pocket through the open sides of the first pocket to retain the distal ends of the first medial strap and the first lateral strap against the instep pad during surgery. The instep pad may have a second pocket situated between the first medial buckle and the first lateral buckle. The second pocket may have open sides. Distal ends of the second medial strap and the second lateral strap may be insertable into the second pocket through the open sides of the second pocket to retain the distal ends of the second medial strap and the second lateral strap against the instep pad during surgery. The instep pad may include a leg-engaging portion that is generally hour glass shaped. A first patch may be coupled to the leg-engaging portion. A second patch may be coupled to the leg-engaging portion. The first pocket may be defined between the first patch and the leg-engaging portion. The second pocket may be defined between the second patch and the leg-engaging portion.

[0011] According to a second aspect of the disclosed embodiments, a surgical boot apparatus for use in surgery involving hip distraction includes a boot shell having a sole portion configured for placement adjacent a sole of a foot of a patient and a calf portion configured for placement adjacent a calf of the patient. Four ladder straps are coupled to the boot shell. The four ladder straps include a first medial strap, a first lateral strap, a second medial strap, and a second lateral strap. An instep pad has four ratchet buckles to interface with the respective ladder straps. The ratchet buckles are operable to tighten the instep pad against the patient's leg when the patient's leg is situated within the boot shell. The ratchet buckles are movable to a released state to permit the instep pad to be completely detached from the four ladder straps.

[0012] In some embodiments of the second aspect, the ladder straps of the first medial strap and the first lateral strap may be of substantially equivalent lengths. The ladder straps of the second medial strap and the second lateral strap may be of substantially equivalent lengths. The ladder straps of the first medial strap, the second medial strap, the first lateral strap, and the second lateral strap may be of substantially equivalent lengths. Proximal ends of the first medial strap and the first lateral strap may be attached to the calf portion of the boot shell. Proximal ends of the second medial strap and the second lateral strap may be attached to a junction region of the boot shell where the sole portion and calf portion meet.

[0013] Optionally, in the second aspect, the instep pad may have a first pocket situated between the

first medial buckle and the first lateral buckle. The first pocket may have open sides. Distal ends of the first medial strap and the first lateral strap may be insertable into the first pocket through the open sides of the first pocket to retain the distal ends of the first medial strap and the first lateral strap against the instep pad during surgery. The instep pad may have a second pocket situated between the first medial buckle and the first lateral buckle. The second pocket may have open sides. Distal ends of the second medial strap and the second lateral strap may be insertable into the second pocket through the open sides of the second pocket to retain the distal ends of the second medial strap and the second lateral strap against the instep pad during surgery.

[0014] It may be desired, in the second aspect, that the instep pad may include a leg-engaging portion that is generally hour glass shaped. A first patch may be coupled to the leg-engaging portion. A second patch may be coupled to the leg-engaging portion. The first pocket may be defined between the first patch and the leg-engaging portion. The second pocket may be defined between the second patch and the leg-engaging portion. Each ladder strap may have a proximal end that is pinned to boot shell to permit each ladder strap to rotate relative to the boot shell about a respective pivot axis.

[0015] It may be contemplated, in the second aspect, that the boot shell may include a heel-receiving opening located between the sole portion and the calf portion and configured for receipt of a heel of the patient. The calf portion of the boot shell may have a plug-receiving opening spaced from the heel-receiving opening. A resilient pad may have a main portion configured for engaging an Achilles area of the patient. A plug may extend from the main portion. The plug may be configured for press fitting into the plug-receiving opening of the boot shell to attach the resilient pad to the boot shell. The main portion may include an end region that extends into the heel-receiving opening. The end region may have an end edge including a notch configured for receipt of a calcaneus of the patient.

[0016] In some embodiments of the second aspect, the plug of the resilient pad may be formed integrally with the main portion. The resilient pad may be made of silicone rubber. The heel-receiving opening may be defined, in part, by a U-shaped edge of the calf portion of the boot shell. The resilient pad may include a U-shaped lip having a groove that receives the U-shaped edge of the calf portion. The U-shaped lip may be formed integrally with the main portion. The plug-receiving opening may be a triangular opening with rounded corners. A periphery of the plug may be triangular with rounded corners. The plug-receiving opening may be defined by an opening edge. The plug may have a peripheral wall formed with a groove that receives the opening edge. The heel-receiving opening and the plug receiving opening may be both centered on a longitudinal axis of the calf portion of the boot shell. A mount may be attached to an underside of the sole portion. The mount may be configured to lock the boot shell to a hip distractor. The mount may include a release input that is movable to unlock the boot shell from the hip distractor to permit the surgical boot apparatus to be detached from the hip distractor.

[0017] Additional features, which alone or in combination with any other feature(s), such as those listed above and those listed in the claims, may comprise patentable subject matter and will become apparent to those skilled in the art upon consideration of the following detailed description of various embodiments exemplifying the best mode of carrying out the embodiments as presently perceived.

Description

BRIEF DESCRIPTION

[0018] The detailed description particularly refers to the accompanying figures in which:

[0019] FIG. **1** is a perspective view of a patient support apparatus including a limb-support unit according to the present disclosure;

[0020] FIG. **2** is a side view of a surgical boot apparatus for use with the patient support apparatus shown in FIG. **1** during surgery involving hip distraction;
[0021] FIG. **3** is an exploded front perspective view of the boot shell and the leg-engaging portion of the instep pad of the surgical boot apparatus shown in FIG. **2**;
[0022] FIG. **4** is a side elevation view of the boot shell shown in FIG. **3**;
[0023] FIG. **5** is a front elevation view of the boot shell shown in FIG. **3**;
[0024] FIG. **6** is a front perspective view of the boot shell shown in FIG. **3**;
[0025] FIG. **7** is a rear perspective view of the boot shell shown in FIG. **3** with a resilient heel pad inserted into the boot shell;
[0026] FIG. **8** is an exploded rear perspective view of the boot shell and the resilient heel pad shown in FIG. **7**; and
[0027] FIG. **9** is a cross-sectional view of the boot shell and the resilient pad taken along line **9-9** shown in FIG. **7** and having a foot positioned in the boot shell without the leg wrap shown in FIG. **2**.

DETAILED DESCRIPTION

[0028] While the concepts of the present disclosure are susceptible to various modifications and alternative forms, specific exemplary embodiments thereof have been shown by way of example in the drawings and will herein be described in detail. It should be understood, however, that there is no intent to limit the concepts of the present disclosure to the particular forms disclosed, but on the contrary, the intention is to cover all modifications, equivalents, and alternatives falling within the spirit and scope of the invention as defined by the appended claims.
[0029] Referring to FIG. **1**, a support apparatus **10** includes, for example, a surgical table **12** and a limb-support unit **14** which is embodied as a hip distractor. The limb-support unit **14** is coupled to a foot end **16** of the surgical table **12**. In an example of use, the limb-support unit **14** supports a patient's legs and the surgical table **12** supports a patient's upper body. The limb-support unit **14** may be used to place tension on the patient's legs during surgery. This is also known as placing the patient's legs in traction. During a hip-replacement surgery, the patient's leg in which the hip is being replaced may need to be repositioned during the surgery to provide the surgeon with improved access while maintaining the patient's leg in traction. The limb-support unit **14** in accordance with the present disclosure provides the ability to reposition the patient's leg while maintaining that leg in traction. The limb support unit **14** is further configured to apply sufficient force on the patient's leg during hip distraction to pull the hip joint out of socket (i.e., pull the femoral head out of the acetabulum).
[0030] The limb-support unit **14** includes a countertraction unit **18**, such as a padded perineal post, and leg holders **22** that each support a boot shell **58** in the illustrative example. The countertraction unit **18** is coupled to the foot end **16** of the surgical table **12** in a fixed position. The leg holders **22** are coupled in spaced-apart relation to the countertraction unit **18**. A moveable leg holder **50** moves relative to the countertraction unit **18** as suggested in FIG. **1**. The moveable leg holder **50** includes a joint mount **24**, a multi-axis joint **26**, and a spar **28**. The joint mount **24** is coupled to the countertraction unit **18** in a fixed position while the limb-support unit **14** supports portions of the patient. The multi-axis joint **26** is arranged to interconnect the spar **28** and the joint mount **24** to cause the spar **28** to move relative to the joint mount **24**. The spar **28** is coupled to the multi-axis joint **26** and arranged to extend away from the multi-axis joint **26** to support the patient's leg in traction during surgery involving hip distraction. A stationary leg holder **52** is stationary and is supported by an accessory rail at the side of the table **12** and the limb-support unit **14** to which the countertraction unit **18** and multi-axis joint **26** are also coupled. The stationary leg holder **52** is detachable from the limb-support unit **14** and surgical table accessory rail; however, in use during surgery, the stationary leg holder **52** is stationary.
[0031] Referring to FIG. **2**, a surgical boot apparatus **100** for use in surgery involving hip distraction includes the boot shell **58** and an instep pad **102** positioned in the boot shell **58** and

secured to the boot shell **58**. The boot shell **58** may be formed from plastic, composites, aluminum, or any other suitable material for supporting a patient's foot during surgery. The boot shell **58** includes a sole portion **104** configured for placement adjacent a sole of the foot of a patient and a calf portion **106** configured for placement adjacent a calf of the patient. The sole portion **104** extends along a longitudinal axis **108** from an end **110** to a junction region **112** of the boot shell **58** where the sole portion **104** and calf portion **106** meet. The calf portion **106** extends along a longitudinal axis **114** from an end **116** to the junction region **112**. The longitudinal axis **108** extends at an angle relative to the longitudinal axis **114**. In some embodiments, the longitudinal axis **108** extends at an orthogonal angle relative to the longitudinal axis **114**. In some embodiments, the longitudinal axis **108** extends at a non-orthogonal angle relative to the longitudinal axis **114**. In some embodiments, the longitudinal axis **108** extends at an acute angle relative to the longitudinal axis **114**. In some embodiments, the longitudinal axis **108** extends at an obtuse angle relative to the longitudinal axis **114**.

[0032] A mount **120** is attached to an underside **122** of the sole portion **104**. The mount **120** extends from the sole portion **104** is a direction opposite the calf portion **106**. The mount **120** is configured to lock the boot shell **58** to the hip distractor **10**. That is, the mount **120** is configured to lock the boot shell **58** to one of the leg holders **22** of the hip distractor. As seen in FIG. **4**, the mount **120** includes a release input **124** that is movable to unlock the boot shell **58** from the hip distractor **10** to permit the surgical boot apparatus **100** to be detached from the hip distractor **10**. In the illustrative example, surgical boot apparatus **100**, and particularly mount **120** of surgical boot apparatus **100**, is configured for mounting to a model no. AR-6529S Arthrex Hip Distraction System (HDS) available from Arthrex Inc. of Naples, Florida. Additional details of mount **120** are shown and described in U.S. Pat. No. 9,381,130 which is hereby incorporated herein by reference to the extent not inconsistent with the present disclosure which shall control as to any inconsistencies (see particularly FIGS. **6-8** of the '130 patent and the related discussion of quick disconnect receiver **15**). In other embodiments, mount **120** is configured for connection to hip distraction systems of other manufacturers such as the Maquet subsidiary of Getinge AB, Steris Corporation, and Smith & Nephew PLC, just to name a few.

[0033] A leg wrap **130** is configured wrap around the foot of the patient and at least partially around the calf of the patient. The leg wrap **130** is configured to be positioned within the boot shell **58**. The leg wrap **130** is formed from a disposable material that facilitates providing comfort to the patient, for example, foam, while the patient's foot is inserted into the boot shell **58**. Other materials may be contemplated. The material may also be selected to warm the patient's foot during surgery. The instep pad **102** includes a leg engaging portion **132** that positions over the leg wrap **130** and is configured to secure the patient's foot within the surgical boot apparatus **100**, as described below.

[0034] Referring now to FIG. **3**, the boot shell **58** includes a medial side **136** and an opposite lateral side **138**. For reference, the medial side **136** is positioned adjacent a midline of the patient. That is, with respect to the hip distractor **10**, the medial side **136** is positioned adjacent a centerline of the hip distractor **10**. The lateral side **138** is positioned away from the midline of the patient. With respect to the hip distractor **10**, the lateral side **138** is positioned away from the centerline of the hip distractor **10**. In some embodiments, the surgical boot apparatus **100** is symmetrical about a centerline between the medial side **136** and the lateral side **138**. Four straps **140** are coupled to and extend from the boot shell **58**. The four straps **140** including a first medial strap **142**, a first lateral strap **144**, a second medial strap **146**, and a second lateral strap **148**.

[0035] A proximal end **150** of the first medial strap **142** is attached to the calf portion **106** of the boot shell **58** on the medial side **136**. A proximal end **152** of the first lateral strap **144** is also attached to the calf portion **106** of the boot shell **58** on the lateral side **138**. Referring to FIGS. **6-8**, the boot shell **58** includes a plurality of pivot points **156**. The proximal end **150** of the first medial strap **142** and the proximal end **152** of the first lateral strap **144** are pinned to a respective pivot point **156** to permit the first medial strap **142** and the first lateral strap **144** to rotate relative to the

boot shell **58** about a respective pivot axis. The first medial strap **142** and the first lateral strap **144** are each embodied as a ladder strap that includes a plurality of ridges **154** to enable the strap to be ratcheted through a buckle, as described below. In some embodiments, other types of straps are used in lieu of ladder straps **142**, **144**, **146**, **148**. In the illustrative embodiment, the first medial strap **142** and the first lateral strap **144** are of substantially equivalent lengths. It will be appreciated that the first medial strap **142** and the first lateral strap **144** may have different lengths in other embodiments.

[0036] A proximal end **160** of the second medial strap **146** is attached to the junction region **112** of the boot shell **58** on the medial side **136**. A proximal end **162** of the second lateral strap **148** is also attached to the junction region **112** of the boot shell **58** on the lateral side **138**. Referring to FIGS. **6-8**, the proximal end **160** of the second medial strap **146** and the proximal end **162** of the second lateral strap **148** are pinned to a respective pivot point **156** to permit the second medial strap **146** and the second lateral strap **148** to rotate relative to the boot shell **58** about a respective pivot axis. The second medial strap **146** and the second lateral strap **148** are each embodied as a ladder strap that includes a plurality of ridges **154** to enable the strap to be ratcheted through a buckle, as described below. In some embodiments, other straps may be contemplated. In the illustrative embodiment, the second medial strap **146** and the second lateral strap **148** are of substantially equivalent lengths. It will be appreciated that the second medial strap **146** and the second lateral strap **148** may have different lengths in other embodiments. In some embodiments, the first medial strap **142**, the second medial strap **146**, the first lateral strap **144**, and the second lateral strap **148** are of substantially equivalent lengths.

[0037] When it is stated herein that straps **142**, **144**, **146**, **148** are of "substantially" equivalent lengths, it is intended to cover lengths that are within +/−10% of each other. For example, if a strap is 10 inches in length, then straps that are 9 inches to 11 inches in length are considered to be of substantially length to the 10-inch strap. That is, 10% of 10 inches is 1 inch. This is given as just one arbitrary example and is not intended to imply that any of straps **142**, **144**, **146**, **148** are ten inches in length, but it is not intended to rule out such a possibility either.

[0038] The leg-engaging portion **132** of the instep pad **102** is generally hour glass shaped. Four buckles **170** are provided on the leg-engaging portion **132** of the instep pad **102** to interface with a respective strap **140**. The buckles **170** are operable to tighten the instep pad **102** against the patient's leg when the patient's leg is situated within the boot shell **58**. The buckles **170** are movable to a released state to permit the instep pad **102** to be completely detached from the four straps **140**.

[0039] A first medial buckle **172** is configured for attachment to the first medial strap **142**. A first lateral buckle **174** is configured for attachment to the first lateral strap **144**. The first medial buckle **172** and the first lateral buckle **174** are each embodied as a ratchet buckle through which the respective first medial ladder strap **142** and first lateral ladder strap **144** are ratcheted. A second medial buckle **176** is configured for attachment to the second medial strap **146**. A second lateral buckle **178** is configured for attachment to the second lateral strap **148**. The second medial buckle **176** and the second lateral buckle **178** are each embodied as a ratchet buckle through which the respective second medial ladder strap **146** and second lateral ladder strap **148** are ratcheted.

[0040] A first patch **180** is coupled to the leg-engaging portion **132** to define a first pocket **182** (shown in FIG. **2**) between the first patch **180** and the leg-engaging portion **132**. The first pocket **182** is situated between the first medial buckle **172** and the first lateral buckle **174**. The first pocket **182** includes open medial side **184** and an open lateral side **186**. A distal end **190** of the first medial strap **142** is insertable into the first pocket **182** through the open medial side **184** of the first pocket **182** to retain the distal end **190** of the first medial strap **142** against the instep pad **102** during surgery. A distal end **192** of the first lateral strap **144** is insertable into the first pocket **182** through the open lateral side **186** of the first pocket **182** to retain the distal end **192** of the first lateral strap **144** against the instep pad **102** during surgery.

[0041] A second patch **200** is coupled to the leg-engaging portion **132** to define a second pocket

202 (shown in FIG. **2**) between the second patch **200** and the leg-engaging portion **132**. The second pocket **202** is situated between the second medial buckle **176** and the second lateral buckle **178**. The second pocket **202** includes open medial side **204** and an open lateral side **206**. A distal end **210** (shown in FIG. **4**) of the second medial strap **146** is insertable into the second pocket **202** through the open medial side **204** of the second pocket **202** to retain the distal end **210** of the second medial strap **146** against the instep pad **102** during surgery. A distal end **212** of the second lateral strap **148** is insertable into the second pocket **202** through the open lateral side **206** of the second pocket **202** to retain the distal end **212** of the second lateral strap **148** against the instep pad **102** during surgery.

[0042] Referring to FIGS. **5** and **6**, the boot shell **58** includes a heel-receiving opening **220**. The heel-receiving opening **220** extends entirely through the boot shell **58**. The heel-receiving opening **220** is located between the sole portion **104** and the calf portion **106** of the boot shell **58**. That is, the heel-receiving opening **220** extends partially through the sole portion **104** of the boot shell **58** and partially through the calf portion **106** of the boot shell **58**. The heel-receiving opening **220** is configured to receive a heel of the patient. Accordingly, when the patient's foot is positioned in the boot shell **58**, the heel of the patient positions within the heel-receiving opening **220**.

[0043] A resilient pad **230** is positioned in the calf portion **106** of the boot shell **58**. In some embodiments, the resilient pad **230** is made of silicone rubber. It will be appreciated that other suitable materials may be used to form the resilient pad **230**. In some embodiments, the resilient pad **230** is molded. For example, the resilient pad **230** may be molded to a specific patient's heel. The resilient pad **230** includes a main portion **232** that is configured for engaging an Achilles area of the patient's foot. The main portion **232** includes an end region **234** having a U-shaped end edge **236**. The U-shaped end edge **236** includes a notch **238** configured for receipt of a calcaneus of the patient's foot. The notch **238** is tapered from the main portion **232** to the U-shaped end edge **236**.

[0044] Referring now to FIGS. **7** and **8**, the heel-receiving opening **220** is defined, in part, by a U-shaped edge **222** of the calf portion **106** of the boot shell **58**. The heel-receiving opening **220** is further defined, in part, by a linear edge **224** of the sole portion **104** of the boot shell **58**, as seen more clearly in FIG. **6**. The heel-receiving opening **220** extends between the U-shaped edge **222** and the linear edge **224**.

[0045] The end region **234** of the resilient pad **230** extends into the heel-receiving opening **220**. The resilient pad **230** includes a U-shaped lip **250** extending along the U-shaped end edge **236** and having a groove **252**. In some embodiments, the U-shaped lip **250** is formed integrally with the main portion **232** of the resilient pad **230**. The groove **252** is configured to receive the U-shaped edge **222** of the calf portion **106** to attach the resilient pad **230** to the boot shell **58**, as illustrated in FIG. **9**. It should be noted that, in FIG. **9**, the patient's foot is shown without the leg wrap **130**, shown FIG. **2**. The diagrammatic image of the foot and lower leg in FIG. **9** is intended to include the leg wrap **130**, but optionally, the leg wrap **130** can be omitted.

[0046] The calf portion **106** of the boot shell **58** also includes a plug-receiving opening **240** spaced from the heel-receiving opening **220**. In some embodiments, the heel-receiving opening **220** and the plug receiving opening **240** are both centered on the longitudinal axis **114** of the calf portion **106** of the boot shell **58**, as illustrated in FIG. **8**. The plug-receiving opening **240** includes a triangular opening defined by an opening edge **242** having rounded corners **244**. It will be appreciated that the plug-receiving opening **240** may have other shapes in other embodiments.

[0047] A plug **260** extends from the main portion **232** of resilient pad **230**. In some embodiments, the plug **260** of the resilient pad **230** is formed integrally with the main portion **232** of the resilient pad **230**. In other embodiments, the plug **260** may be formed separately from the main portion **232** of the resilient pad **230**. A peripheral wall **262** of the plug **260** is generally triangular with rounded corners **264**. It will be appreciated that the plug **260** may have other shapes in other embodiments. The plug **260** is generally sized and shaped to the plug-receiving opening **240**. The plug **260** is configured for press fitting into the plug-receiving opening **240** of the boot shell **58** to attach the

resilient pad **230** to the boot shell **58**. The peripheral wall **262** includes a groove **266** that is configured to receive the opening edge **242** of the plug-receiving opening **240** of the calf portion **106** to attach the resilient pad **230** to the boot shell **58**, as illustrated in FIG. **9**.

[0048] During use of the surgical boot apparatus **100**, traction pulls the calcaneus of the patient's foot into contact with the resilient pad **230** to prevent heel lift. It should be noted that with the leg wrap **130** present on the patient's foot, the calcaneus does not directly contact the resilient pad **230**. Rather, the leg wrap **130** is positioned between the calcaneus and the resilient pad **230**. In some embodiments, the resilient pad **230** comfortably captures the top of the patient's calcaneus to create a strong hold while reducing the risk of pressure injury. In some embodiments, the leg-engaging portion **132** of the instep pad **102** conforms to the top of the patient's ankle and lower shin. The leg-engaging portion **132** of the instep pad **102** has ratcheting buckles **170** at the top and bottom of the pad **102** on the lateral and medial side of the patient's leg to keep the pad **102** centered on the patient's leg/foot and to create symmetrical pressure to pull the heel back into the boot shell **58**. This pressure forces the heel to be captured by the resilient pad **230**.

[0049] Any theory, mechanism of operation, proof, or finding stated herein is meant to further enhance understanding of principles of the present disclosure and is not intended to make the present disclosure in any way dependent upon such theory, mechanism of operation, illustrative embodiment, proof, or finding. It should be understood that while the use of the word preferable, preferably or preferred in the description above indicates that the feature so described can be more desirable, it nonetheless cannot be necessary and embodiments lacking the same can be contemplated as within the scope of the disclosure, that scope being defined by the claims that follow.

[0050] In reading the claims it is intended that when words such as “a,” “an,” “at least one,” “at least a portion” are used there is no intention to limit the claim to only one item unless specifically stated to the contrary in the claim. When the language “at least a portion” and/or “a portion” is used, the item can include a portion and/or the entire item unless specifically stated to the contrary.

[0051] It should be understood that only selected embodiments have been shown and described and that all possible alternatives, modifications, aspects, combinations, principles, variations, and equivalents that come within the spirit of the disclosure as defined herein or by any of the following claims are desired to be protected. While embodiments of the disclosure have been illustrated and described in detail in the drawings and foregoing description, the same are to be considered as illustrative and not intended to be exhaustive or to limit the disclosure to the precise forms disclosed. Additional alternatives, modifications and variations can be apparent to those skilled in the art. Also, while multiple inventive aspects and principles have been presented, they need not be utilized in combination, and many combinations of aspects and principles are possible in light of the various embodiments provided above.

Claims

1. A surgical boot apparatus for use in surgery involving hip distraction, the surgical boot apparatus comprising a boot shell having a sole portion configured for placement adjacent a sole of a foot of a patient and a calf portion configured for placement adjacent a calf of the patient, four ladder straps coupled to the boot shell, the four ladder straps including a first medial strap, a first lateral strap, a second medial strap, and a second lateral strap, and an instep pad having four ratchet buckles to interface with the respective ladder straps, wherein the ratchet buckles are operable to tighten the instep pad against the patient's leg when the patient's leg is situated within the boot shell, and wherein the ratchet buckles are movable to a released state to permit the instep pad to be completely detached from the four ladder straps.

2. The surgical boot apparatus of claim 1, wherein the ladder straps of the first medial strap and the first lateral strap are of substantially equivalent lengths.

3. The surgical boot apparatus of claim 1, wherein the ladder straps of the second medial strap and the second lateral strap are of substantially equivalent lengths.
4. The surgical boot apparatus of claim 1, wherein the ladder straps of the first medial strap, the second medial strap, the first lateral strap, and the second lateral strap are of substantially equivalent lengths.
5. The surgical boot apparatus of claim 1, wherein proximal ends of the first medial strap and the first lateral strap are attached to the calf portion of the boot shell and wherein proximal ends of the second medial strap and the second lateral strap are attached to a junction region of the boot shell where the sole portion and calf portion meet.
6. The surgical boot apparatus of claim 5, wherein the instep pad has a first pocket situated between the first medial buckle and the first lateral buckle, the first pocket has open sides, and distal ends of the first medial strap and the first lateral strap are insertable into the first pocket through the open sides of the first pocket to retain the distal ends of the first medial strap and the first lateral strap against the instep pad during surgery.
7. The surgical boot apparatus of claim 6, wherein the instep pad has a second pocket situated between the first medial buckle and the first lateral buckle, the second pocket has open sides, and distal ends of the second medial strap and the second lateral strap are insertable into the second pocket through the open sides of the second pocket to retain the distal ends of the second medial strap and the second lateral strap against the instep pad during surgery.
8. The surgical boot apparatus of claim 7, wherein the instep pad includes a leg-engaging portion that is generally hour glass shaped, a first patch coupled to the leg-engaging portion, and a second patch coupled to the leg-engaging portion, wherein the first pocket is defined between the first patch and the leg-engaging portion, and the second pocket is defined between the second patch and the leg-engaging portion.
9. The surgical boot apparatus of claim 1, wherein each ladder strap has a proximal end that is pinned to boot shell to permit each ladder strap to rotate relative to the boot shell about a respective pivot axis.
10. The surgical boot apparatus of claim 1, wherein the boot shell includes a heel-receiving opening located between the sole portion and the calf portion and configured for receipt of a heel of the patient, the calf portion of the boot shell having a plug-receiving opening spaced from the heel-receiving opening, and further comprising a resilient pad having a main portion configured for engaging an Achilles area of the patient and a plug extending from the main portion, the plug being configured for press fitting into the plug-receiving opening of the boot shell to attach the resilient pad to the boot shell, the main portion including an end region that extends into the heel-receiving opening, and the end region having an end edge including a notch configured for receipt of a calcaneus of the patient.
11. The surgical boot apparatus of claim 10, wherein the plug of the resilient pad is formed integrally with the main portion.
12. The surgical boot apparatus of claim 11, wherein the resilient pad is made of silicone rubber.
13. The surgical boot apparatus of claim 10, wherein the heel-receiving opening is defined, in part, by a U-shaped edge of the calf portion of the boot shell and wherein the resilient pad includes a U-shaped lip having a groove that receives the U-shaped edge of the calf portion.
14. The surgical boot apparatus of claim 13, wherein the U-shaped lip is formed integrally with the main portion.
15. The surgical boot apparatus of claim 10, wherein the plug-receiving opening is a triangular opening with rounded corners.
16. The surgical boot apparatus of claim 15, wherein a periphery of the plug is triangular with rounded corners.
17. The surgical boot apparatus of claim 10, wherein the plug-receiving opening is defined by an opening edge and the plug has a peripheral wall formed with a groove that receives the opening

edge.

18. The surgical boot apparatus of claim 10, wherein the heel-receiving opening and the plug receiving opening are both centered on a longitudinal axis of the calf portion of the boot shell.

19. The surgical boot apparatus of claim 1, further comprising a mount attached to an underside of the sole portion, the mount being configured to lock the boot shell to a hip distractor.

20. The surgical boot apparatus of claim 19, wherein the mount includes a release input that is movable to unlock the boot shell from the hip distractor to permit the surgical boot apparatus to be detached from the hip distractor.