AMPLIFY®
SURGICAL

SEEING IS BELIEVING

dualPortal® + dualX®

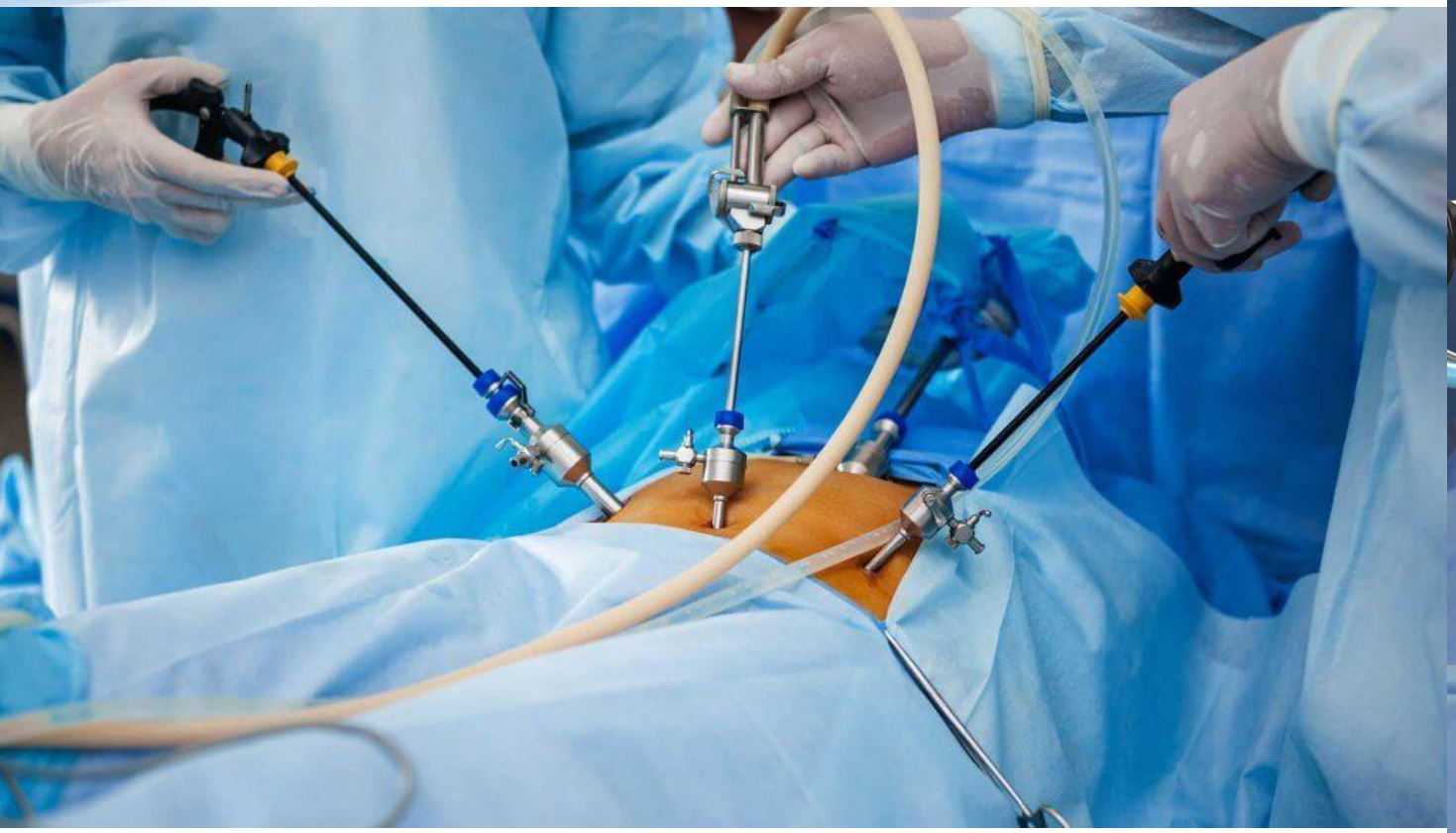
A novel **two-portal endoscopic** approach to the spine

The Problem

Less than 25% of all spine procedures are performed in a minimally invasive way, 4% Endoscopically

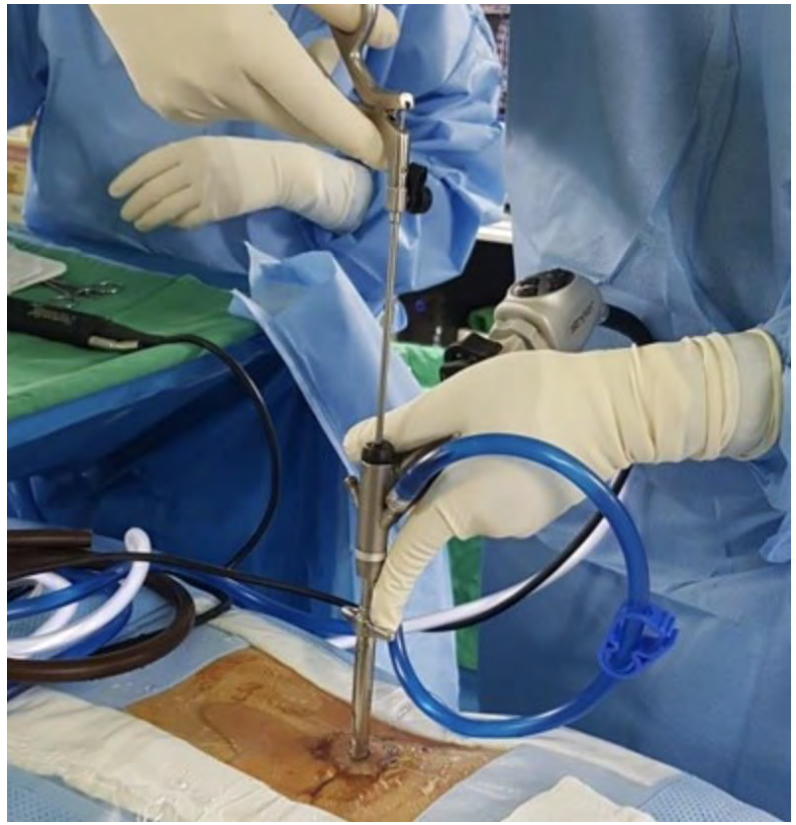
	COMMON SPINAL SURGERY	COMMON MIS SURGERY
BLOOD LOSS	1018 mL	200mL
INTRA-OP COMPLICATIONS	9%	1.6%
HOSPITAL STAY	5 days	< 24 hours
INCISION LENGTH	10cm	< 1cm

Endoscopy in Other Surgeries



Endoscopy in Spine - Challenges

- Too difficult
- Too expensive
- Limited to only a small % of procedural types
- No robust solutions for more common procedures
  - e.g. Lumbar Fusions
- **Inferior surgical implant options for endoscopic fusion**



The Solution

dualPortal Endoscopic Spine

dualPortal®

THE dualPortal® SPINAL ENDOSCOPY

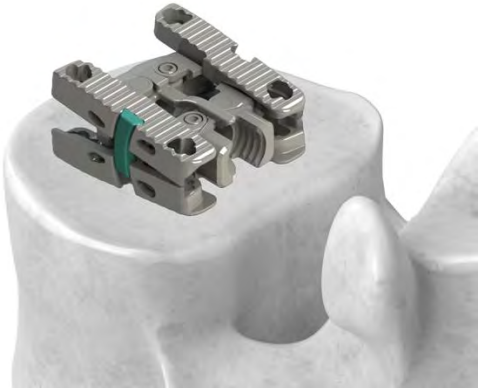
The dualPortal® solution is a novel two-portal endoscopic approach to the spine that allows surgeons to easily learn and perform a wider array of lumbar spine procedures with lower cost compared to the conventional one-portal technique. It also provides flexibility to perform endoscopic lumbar fusions with the dualX® Expanding Interbody Fusion System.

Why dualPortal® Spine?

Compared to uni-portal spine endoscopy.

- **Shorter Learning Curve:** similar workflow to a familiar posterior approach.
- **Lower Cost:** compatible with widely available endoscopic systems.
- **Versatility:** accommodates a variety of lumbar procedures, including multi-level fusions.

dualPortal® + dualX®



Greater Flexibility

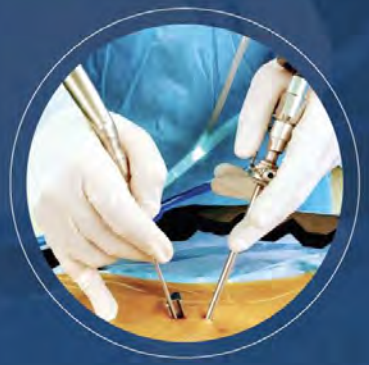
Enhanced Visualization

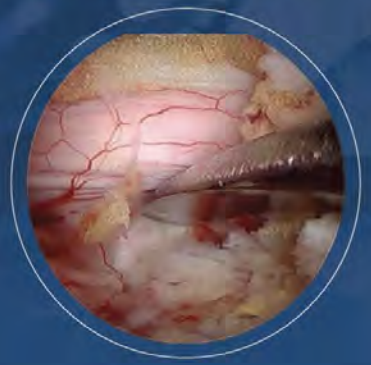
Shallow Learning Curve

dualPortal Access System

AMPLIFY SURGICAL

dualPortal®





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The dualPortal® solution is a novel two-portal endoscopic approach to the spine that allows surgeons to easily learn and perform a wider array of lumbar spine procedures with lower cost compared to the conventional one-portal technique. It also provides flexibility to perform endoscopic lumbar fusions with the dualX® Expanding Interbody Fusion System.

- Greater Flexibility
- Enhanced Visualization
- Shallow Learning Curve

dualPortal® CANNULA

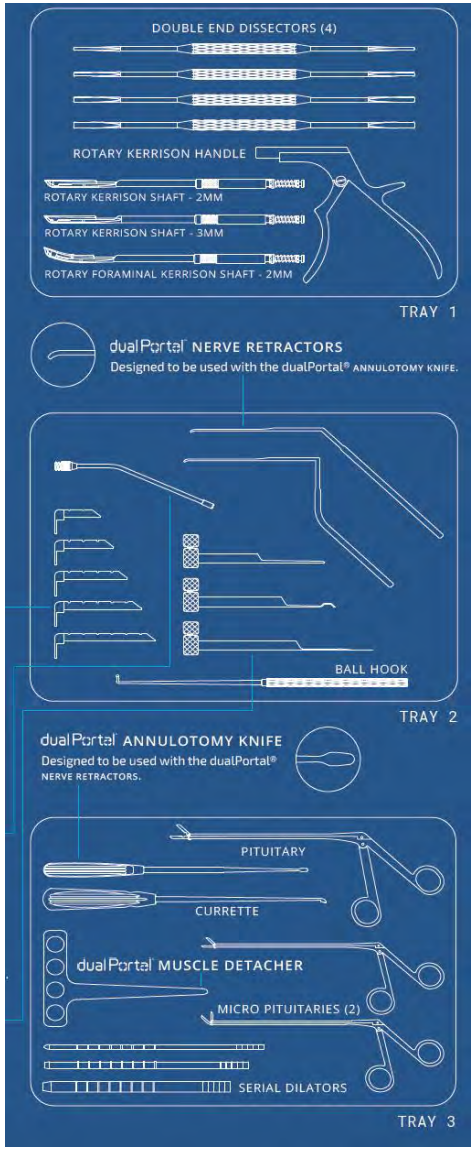
- Manages irrigation fluid control.
- Critical for visualization.
- Facilitates easy access for working instruments.

dualPortal® HEMOSTATIC TUBE

Delivers hemostatic agent to targeted site.

dualPortal® SCOPE RETRACTOR

Transforms the endoscope additionally into a retractor.



Introducing

dualPortal® 2.0

ENDOSCOPIC SYSTEM

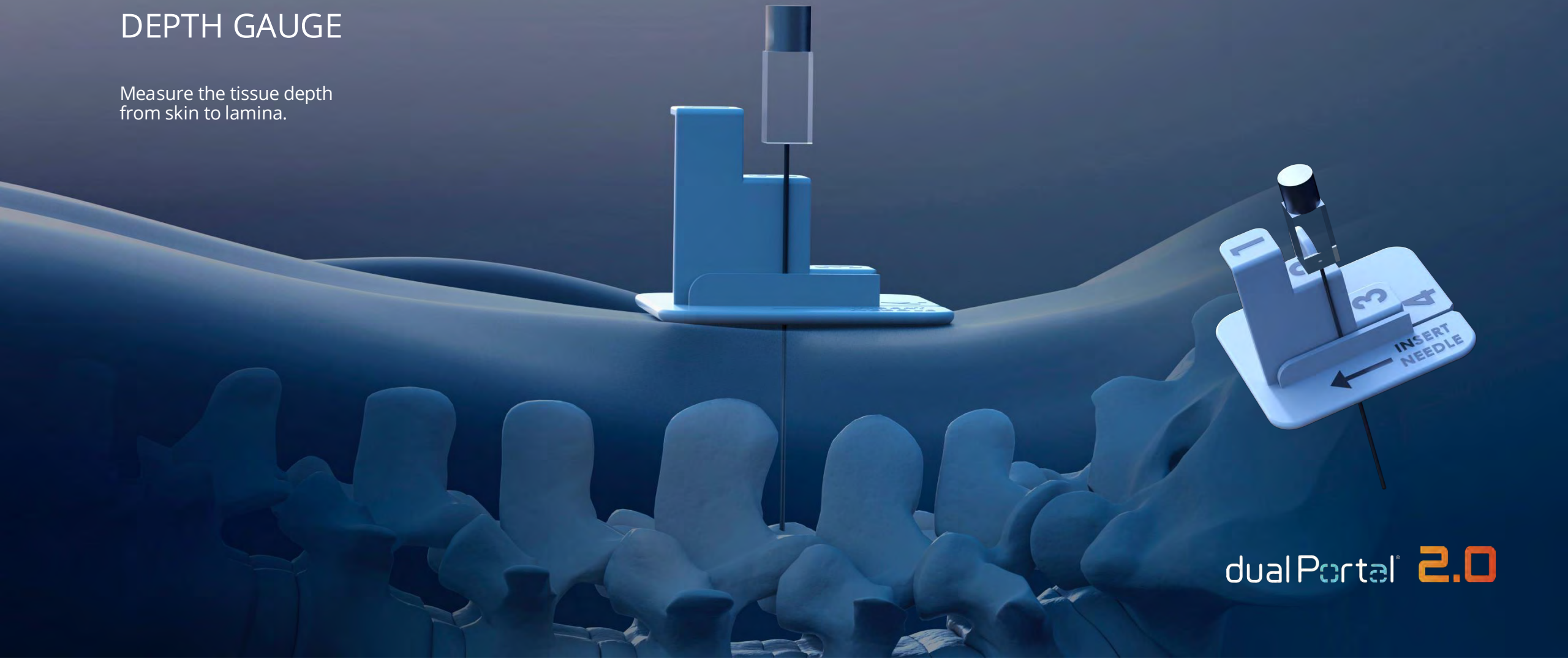
DESIGNED TO BE SEEN

A COMPREHENSIVE SOLUTIONFROM O.R. PREP TO FINAL CLOSE

AMPLIFY® SURGICAL

DEPTH GAUGE

Measure the tissue depth
from skin to lamina.



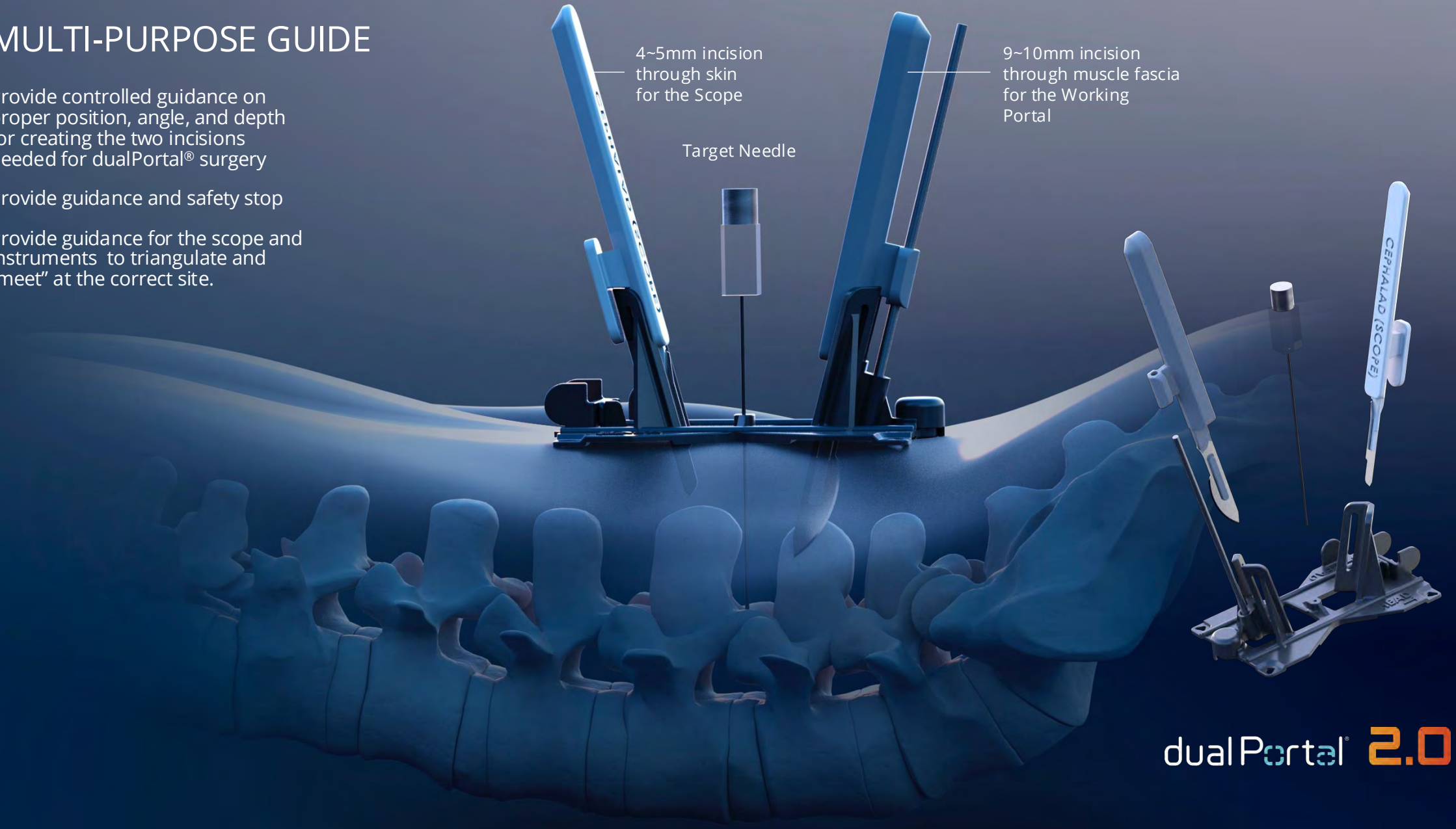
dualPortal® 2.0

MULTI-PURPOSE GUIDE

Provide controlled guidance on proper position, angle, and depth for creating the two incisions needed for dualPortal® surgery

Provide guidance and safety stop

Provide guidance for the scope and instruments to triangulate and "meet" at the correct site.



dualPortal® 2.0

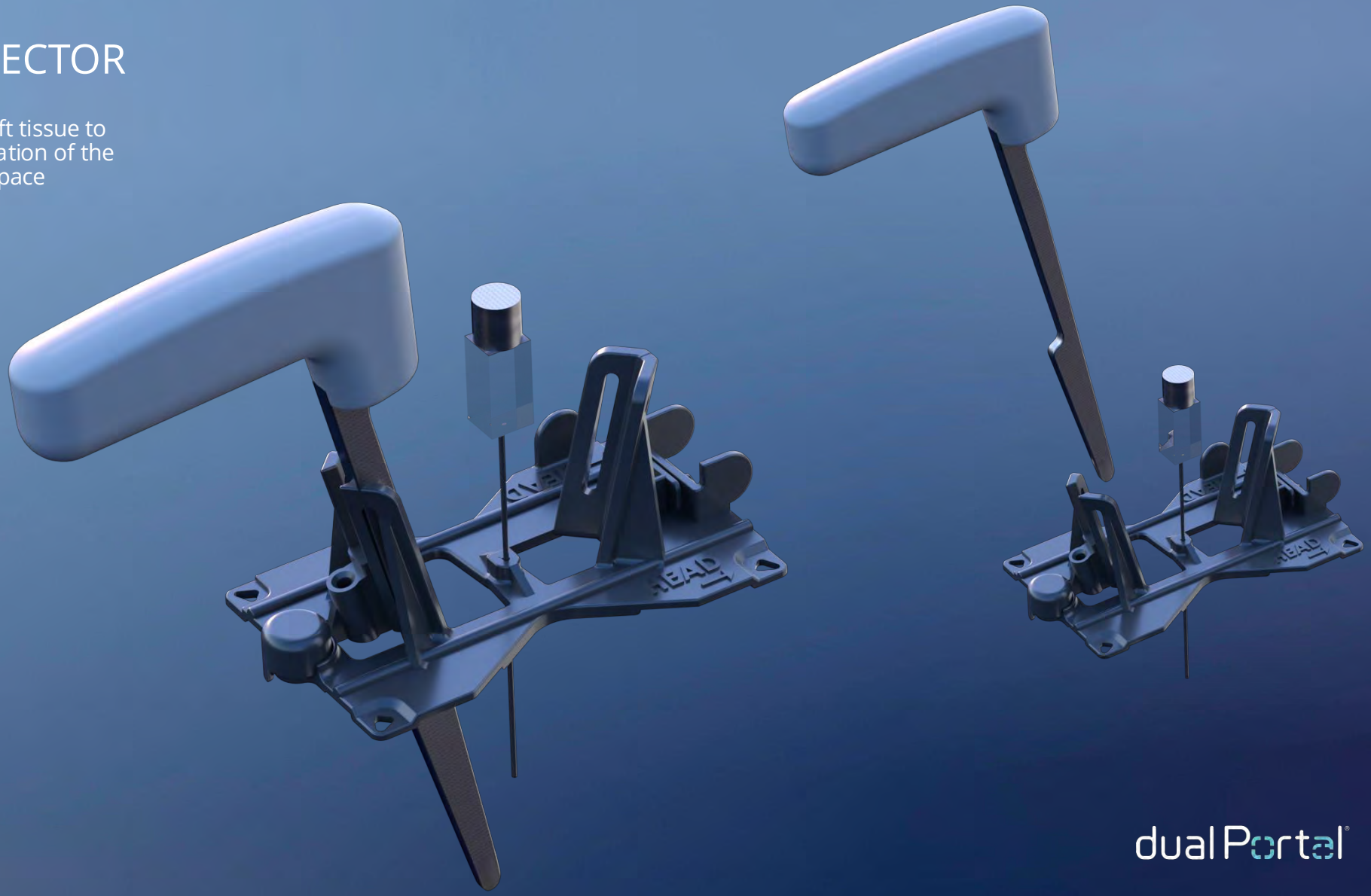
ANGLE GUIDE

Provide controlled guidance on proper position, angle, and depth for creating the two incisions needed for dualPortal® surgery

dualPortal® 2.0

TISSUE DISSECTOR

Dissect and loosen soft tissue to prepare space for creation of the endoscopic working space



dualPortal® 2.0

ERGONOMIC SCOPE HANDLE

Ergonomic Scope Handle to distribute weight and provide support

Detachable Stabilizer Legs for additional support

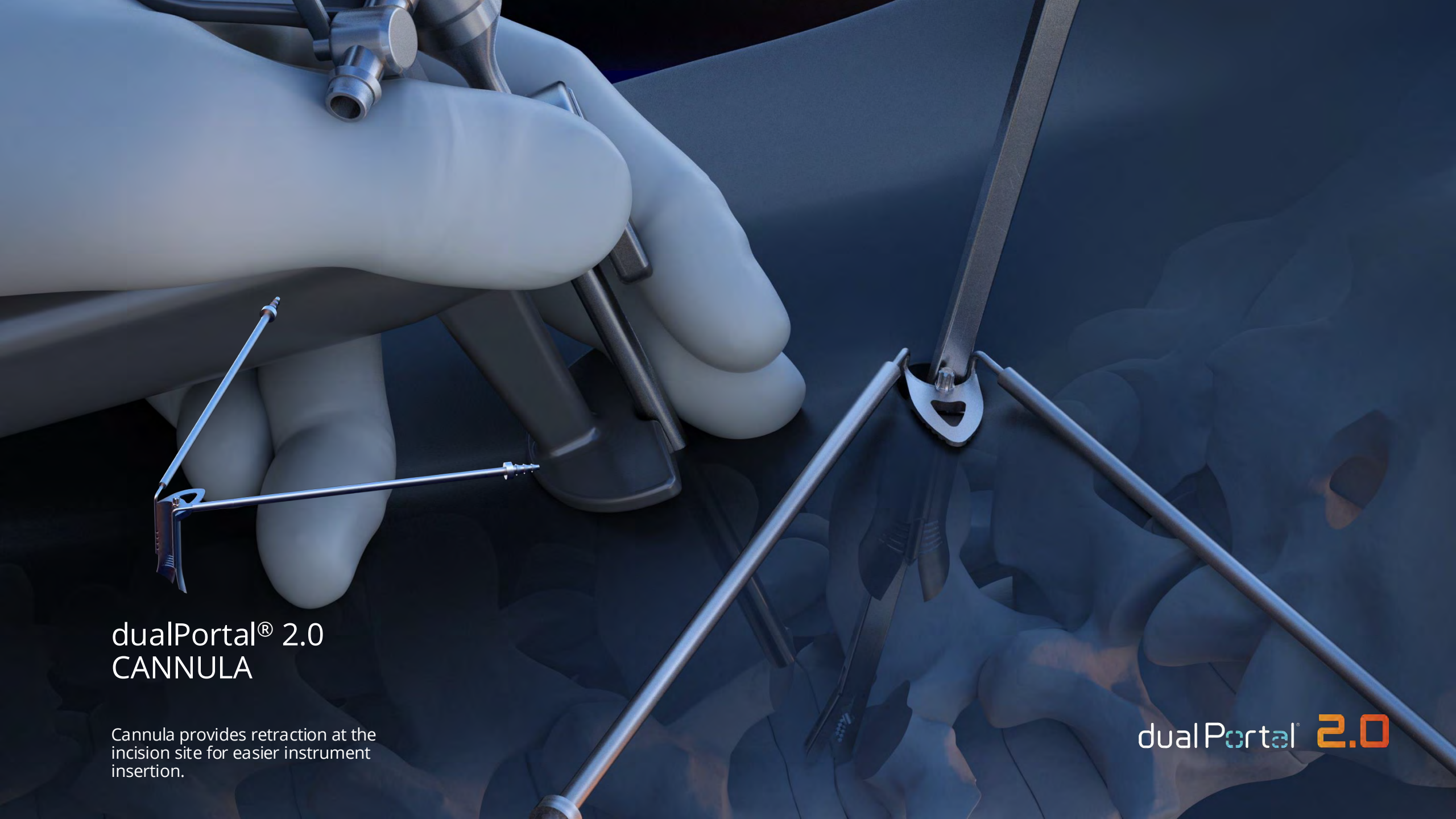
dualPortal® 2.0

dualPortal® 2.0

ERGONOMIC SCOPE HANDLE

Ergonomic Scope Handle to distribute weight and provide support

Detachable Stabilizer Legs for additional support



dualPortal® 2.0 CANNULA

Cannula provides retraction at the incision site for easier instrument insertion.

dualPortal® 2.0

DUALPORTAL 2.0 CANNULA

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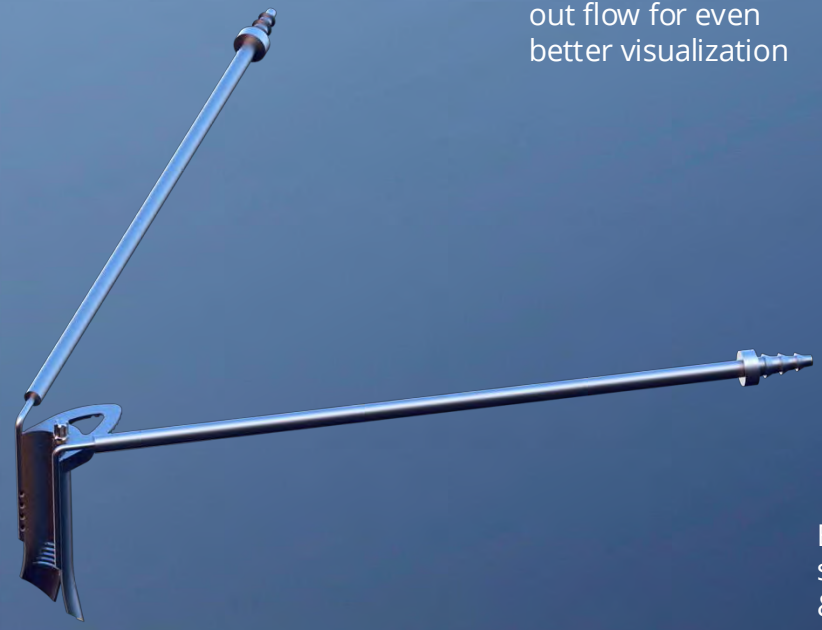
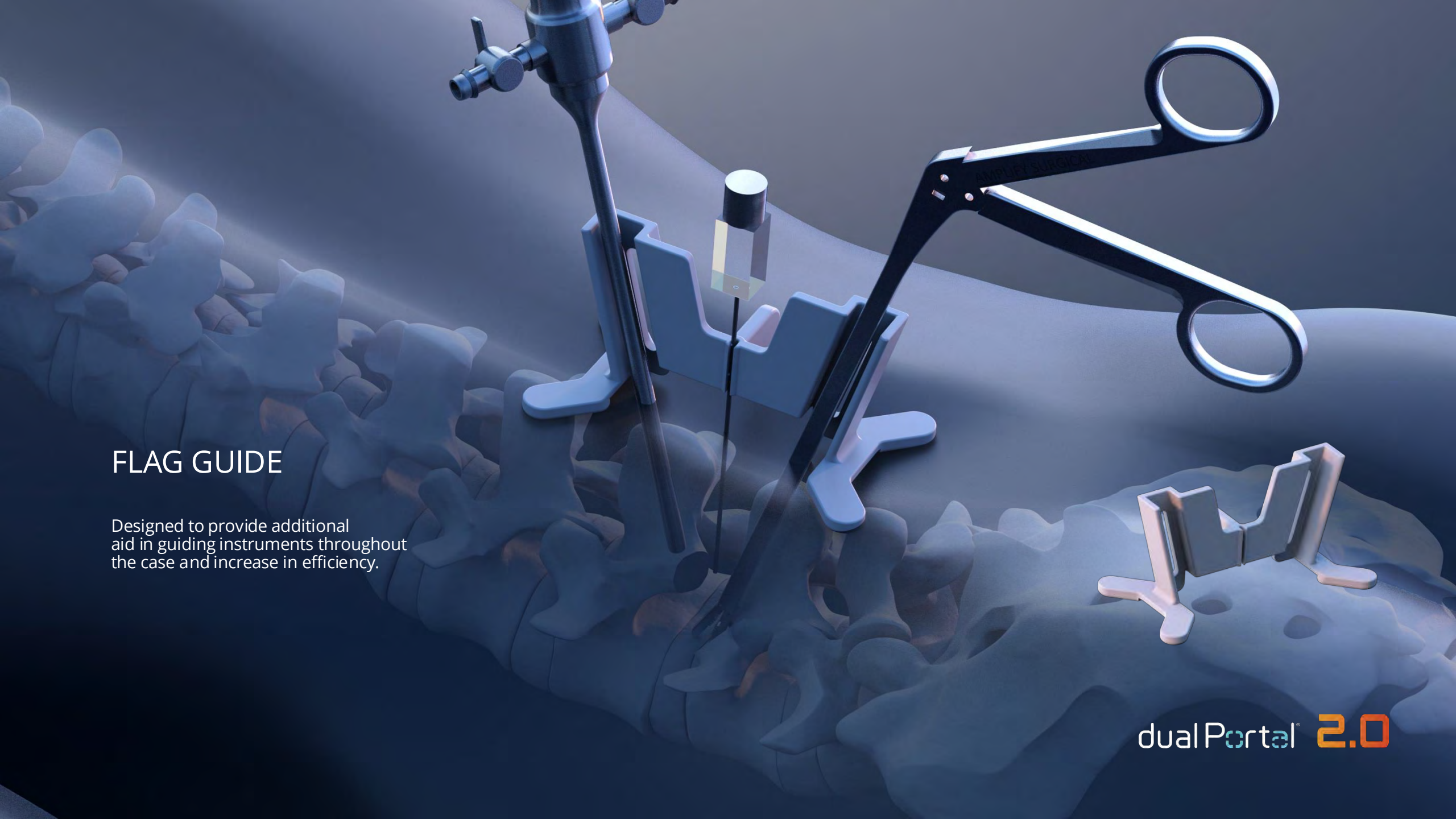


Active in-flow and out flow for even better visualization

Expanding tip for secure placement & retention.

Distal flare for additional soft tissue retraction

dualPortal® 2.0



FLAG GUIDE

Designed to provide additional aid in guiding instruments throughout the case and increase in efficiency.

dualPortal® 2.0

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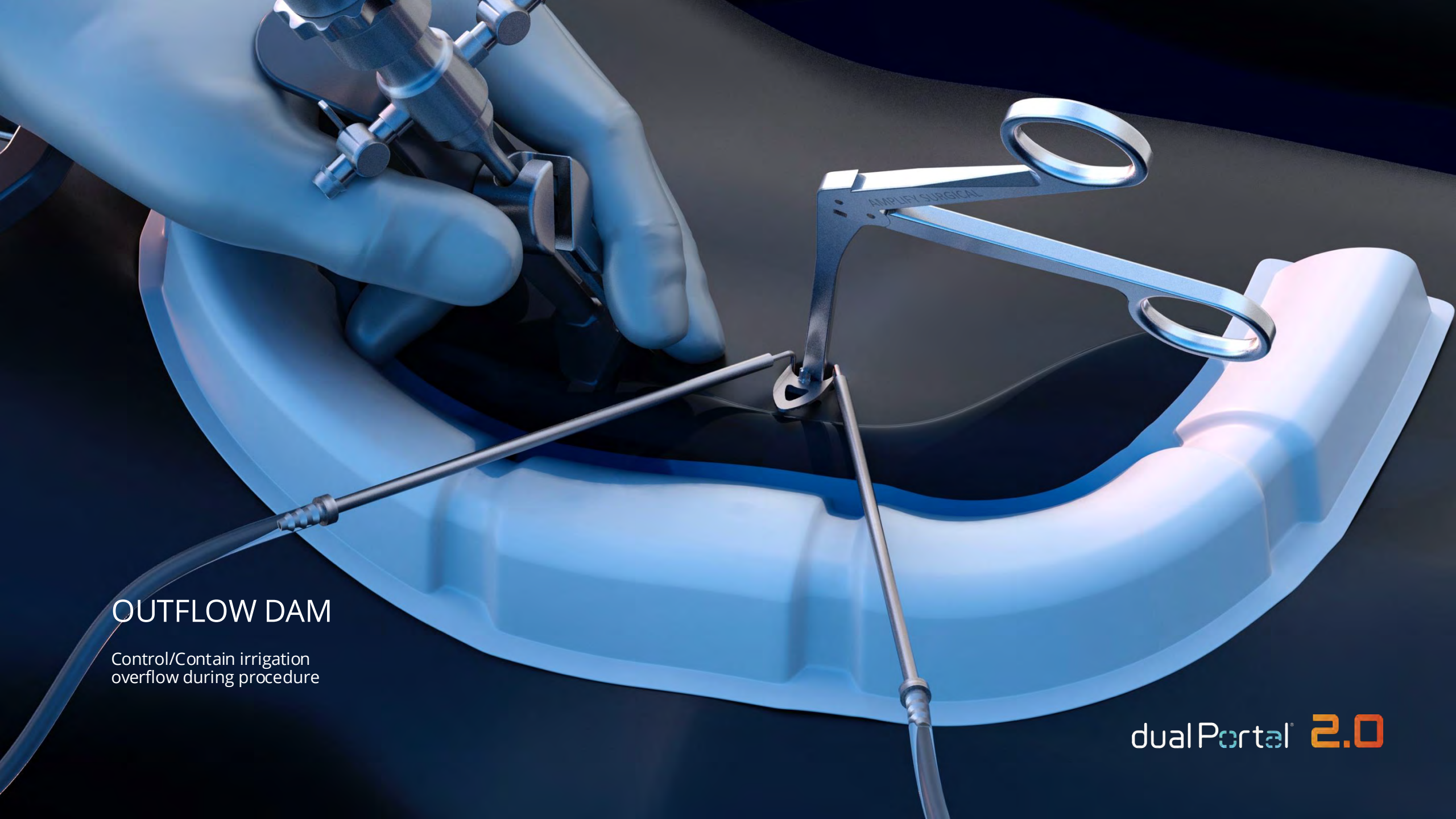
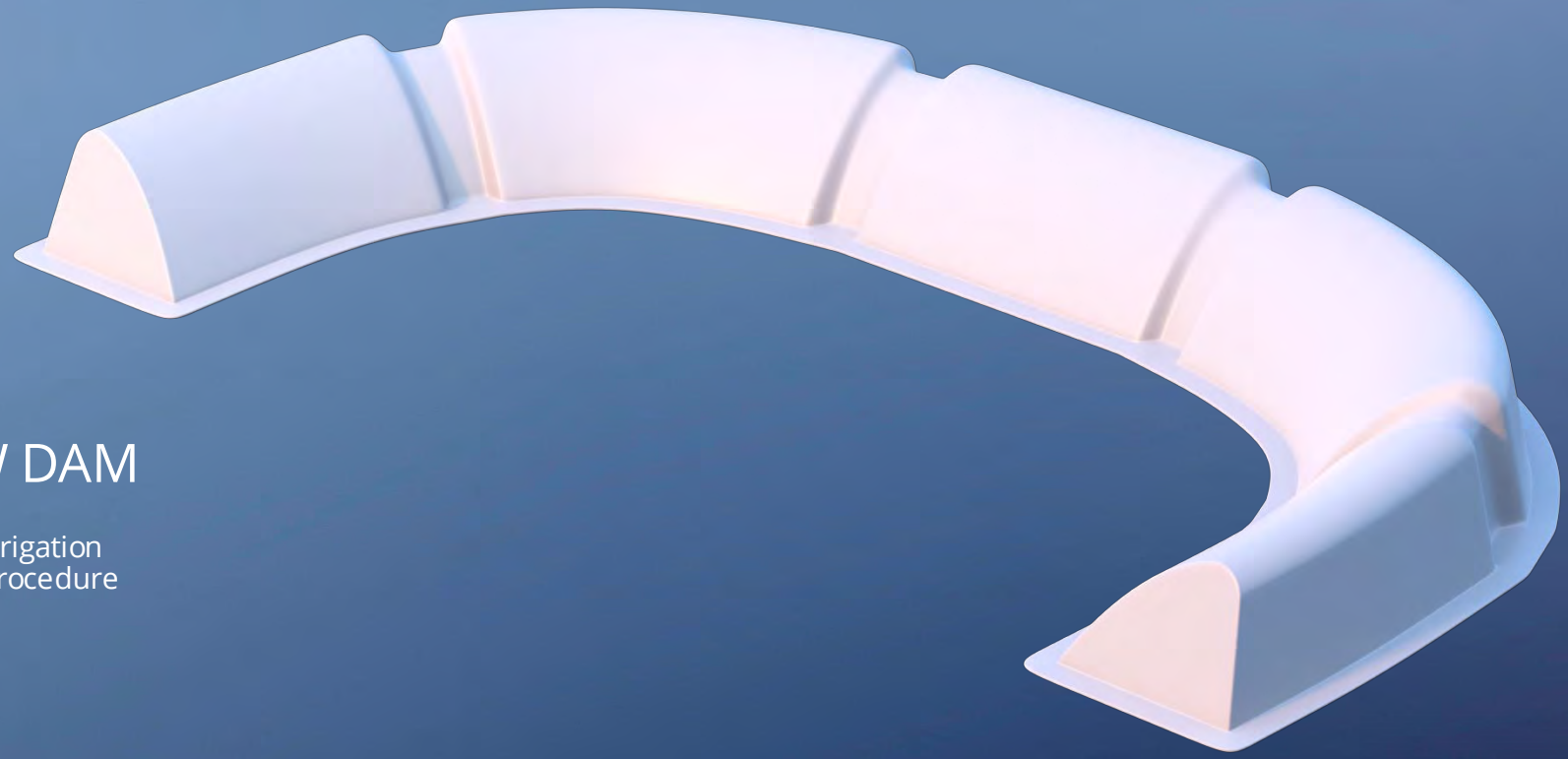
dualPortal® 2.0



OUTFLOW DAM

Control/Contain irrigation
overflow during procedure

dualPortal® 2.0



OUTFLOW DAM

Control/Contain irrigation
overflow during procedure

dualPortal® 2.0

BONE WAX DISPENSER

A syringe-type instrument to dispense small amount of bone wax at the tip and apply it to bleeding bone.

Unique bone conforming tip.

dualPortal® 2.0

dualPortal® 2.0

MULTI-PURPOSE GUIDE

Provide controlled guidance on proper position, angle, and depth for creating the two incisions needed for dualPortal® surgery

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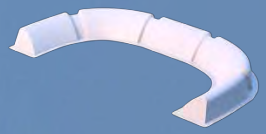

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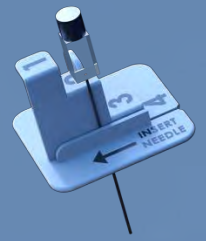

DEPTH GAGE

Measure the tissue depth from skin to lamina.

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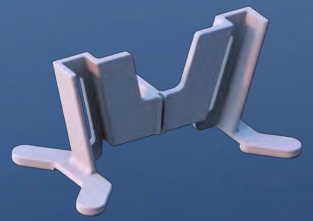
Ergonomic Scope Handle to distribute weight and provide support

Detachable Stabilizer Legs for additional support



FLAG GUIDE

Designed to provide additional aid in guiding instruments throughout the case and increase in efficiency.

BONE WAX DISPENSER

A syringe-type instrument to dispense small amount of bone wax at the tip and apply it to bleeding bone.

Unique bone conforming tip.

Patented Procedural Solution

(19) **United States**
(12) **Patent Application Publication**
Choi et al.
(10) **Pub. No.: US 2024/0390031 A1**
(43) **Pub. Date: Nov. 28, 2024**

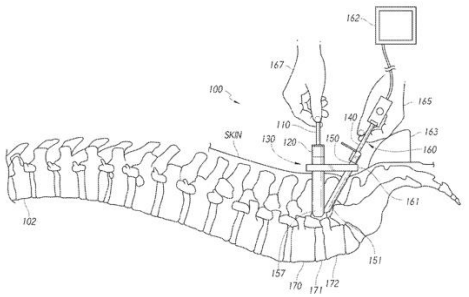
(54) **MULTI-PORTAL SURGICAL TOOLS AND SYSTEMS**

(71) Applicant: **Amplify Surgical, Inc.**, Irvine, CA (US)
(72) Inventors: **Andy Wonyong Choi**, Irvine, CA (US); **Clark Hutton**, Carlsbad, CA (US)

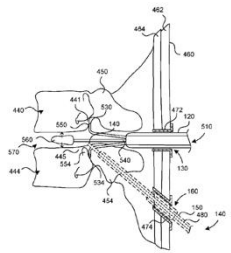
(21) Appl. No.: **18/674,784**
(22) Filed: **May 24, 2024**
Related U.S. Application Data
(60) Provisional application No. 63/504,248, filed on May 25, 2023, provisional application No. 63/611,874, filed on Dec. 19, 2023.
Publication Classification
(51) **Int. Cl.**
A61B 17/34 (2006.01)
A61B 90/50 (2006.01)
(52) **U.S. Cl.**
CPC ***A61B 17/3423*** (2013.01); ***A61B 90/50*** (2016.02); *A61B 2017/3443* (2013.01); *A61B 2017/3447* (2013.01)

(57) **ABSTRACT**

A multi-portal method for treating a subject's spine includes distracting adjacent vertebrae using a distraction instrument positioned at a first entrance along the subject to enlarge an intervertebral space between the adjacent vertebrae. An interbody fusion implant can be delivered into the enlarged intervertebral space. The interbody fusion implant can be positioned directly between vertebral bodies of the adjacent vertebrae while endoscopically viewing the interbody fusion implant using an endoscopic instrument. The patient's spine can be visualized using endoscopic techniques to view, for example, the spine, tissue, instruments, and implants before, during, and after implantation, or the like. The visualization can help a physician throughout the surgical procedure to improve patient outcome.



(65) **Prior Publication Data**
US 2021/0068975 A1 Mar. 11, 2021
(51) **Int. Cl.**
A61F 2/44 (2006.01)
A61B 17/02 (2006.01)
A61B 1/00 (2006.01)
A61B 17/68 (2006.01)
(52) **U.S. Cl.**
CPC ***A61F 2/4455*** (2013.01); ***A61B 1/0005*** (2013.01); ***A61B 17/025*** (2013.01); *A61B 2017/0256* (2013.01); *A61B 2017/681* (2013.01)
(58) **Field of Classification Search**
CPC A61F 2/44–447; A61F 2/4611
See application file for complete search history.



(12) **United States Patent**
Choi et al.
(10) **Patent No.: US 11,678,906 B2**
(45) **Date of Patent: Jun. 20, 2023**

(54) **MULTI-PORTAL SURGICAL SYSTEMS, CANNULAS, AND RELATED TECHNOLOGIES**

(71) Applicant: **Amplify Surgical, Inc.**, Laguna Hills, CA (US)
(72) Inventors: **Andy Wonyong Choi**, Irvine, CA (US); **Dong-Hwa Heo**, Seoul (KR); **Jeffrey Roh**, Seattle, WA (US)
(73) Assignee: **Amplify Surgical, Inc.**, Irvine, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 408 days.
(21) Appl. No.: **16/687,520**
(22) Filed: **Nov. 18, 2019**
(65) **Prior Publication Data**
US 2021/0068863 A1 Mar. 11, 2021
Related U.S. Application Data
(63) Continuation-in-part of application No. 16/565,403, filed on Sep. 9, 2019, now Pat. No. 11,464,648.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,390,683 A 2/1995 Pisharodi
5,437,637 A * 8/1995 Lieber A61M 25/003 600/549
(Continued)

FOREIGN PATENT DOCUMENTS

CN 105636555 A 6/2016
EP 3016617 A2 5/2016
(Continued)

OTHER PUBLICATIONS

Choi, Chang Myong et al. "How I do it? Biportal endoscopic spinal surgery (BESS) for treatment of lumbar spinal stenosis." Acta Neurochir (2016) 158:459-463; published Jan. 18, 2016.
(Continued)

Primary Examiner — Eduardo C Robert
Assistant Examiner — Steven J Cotroneo
(74) *Attorney, Agent, or Firm* — Perkins Coie LLP

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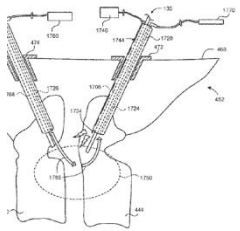
17 Claims, 20 Drawing Sheets



(10) **Patent No.: US 11,464,648 B2**
(45) **Date of Patent: Oct. 11, 2022**

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,171,279 A * 12/1992 Mathews A61F 2/4455 128/898
5,390,683 A 2/1995 Pisharodi
5,762,629 A 6/1998 Kambin
5,782,832 A 7/1998 Larsen et al.
(Continued)

FOREIGN PATENT DOCUMENTS

CN 105636555 A 6/2016
EP 3016617 A2 5/2016
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(Continued)

.01); ***A61B 5/24 /4893*** (2013.01);
B 17/3421–3423
arch history.

(12) **United States Patent**
Choi et al.
(10) **Patent No.: US 12,226,319 B2**
(45) **Date of Patent: Feb. 18, 2025**

(54) **MULTI-PORTAL SURGICAL SYSTEMS**

(71) Applicant: **Amplify Surgical, Inc.**, Laguna Hills, CA (US)
(72) Inventors: **Andy Wonyong Choi**, Irvine, CA (US); **Dong-Hwa Heo**, Seoul (KR); **Jeffrey Roh**, Seattle, WA (US)
(73) Assignee: **Amplify Surgical, Inc.**, Irvine, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.
(21) Appl. No.: **17/902,685**
(22) Filed: **Sep. 2, 2022**
(65) **Prior Publication Data**
US 2023/0104335 A1 Apr. 6, 2023
Related U.S. Application Data
(63) Continuation of application No. 16/565,403, filed on Sep. 9, 2019, now Pat. No. 11,464,648.
(51) **Int. Cl.**

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,486,505 A 12/1969 Morrison
5,171,279 A 12/1992 Mathews
(Continued)

FOREIGN PATENT DOCUMENTS

CN 105636555 A 6/2016
EP 3016617 A2 5/2016
(Continued)

OTHER PUBLICATIONS

Choi, Chang Myong et al. "How I do it? Biportal endoscopic spinal surgery (BESS) for treatment of lumbar spinal stenosis." Acta Neurochir (2016) 158:459-463; published Jan. 18, 2016.
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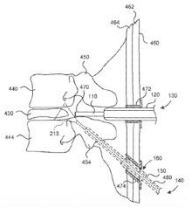
14 Drawing Sheets



(12) **United States Patent**
Choi et al.
(10) **Patent No.: US 12,245,791 B2**
(45) **Date of Patent: Mar. 11, 2025**

(54) **MULTI-PORTAL SURGICAL SYSTEMS, CANNULAS, AND RELATED TECHNOLOGIES**

(71) Applicant: **Amplify Surgical, Inc.**, Irvine, CA (US)
(72) Inventors: **Andy Wonyong Choi**, Irvine, CA (US); **Dong-Hwa Heo**, Seoul (KR); **Jeffrey Roh**, Seattle, WA (US)
(73) Assignee: **Amplify Surgical, Inc.**, Irvine, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.
(21) Appl. No.: **18/314,105**
(22) Filed: **May 8, 2023**
(65) **Prior Publication Data**
US 2023/0329751 A1 Oct. 19, 2023
Related U.S. Application Data
(63) Continuation of application No. 16/687,520, filed on Nov. 18, 2019, now Pat. No. 11,678,906, which is a
(Continued)
(51) **Int. Cl.**
A61B 17/34 (2006.01)
A61B 5/00 (2006.01)
(Continued)
(52) **U.S. Cl.**
CPC ***A61B 17/3423*** (2013.01); ***A61B 5/24*** (2021.01); ***A61B 5/4893*** (2013.01);
(Continued)
(58) **Field of Classification Search**
CPC A61F 2/44–447; A61F 2/4611; A61B 17/025; A61B 2017/0256–0262; A61B 2017/3445; A61B 2017/3447
See application file for complete search history.

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5,171,279 A 12/1992 Mathews
(Continued)

FOREIGN PATENT DOCUMENTS

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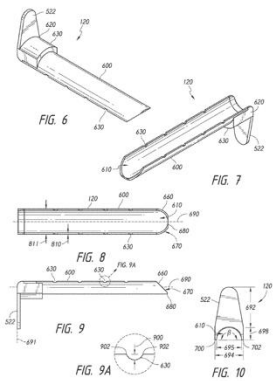
22 Claims, 20 Drawing Sheets



(12) **United States Patent**
Choi et al.
(10) **Patent No.: US 11,950,770 B1**
(45) **Date of Patent: Apr. 9, 2024**

(54) **MULTI-PORTAL SPLIT CANNULAS, ENDOSCOPIC HEMOSTATIC DISPENSERS AND SURGICAL TOOLS**

(71) Applicant: **Amplify Surgical, Inc.**, Irvine, CA (US)
(72) Inventors: **Andy Wonyong Choi**, Irvine, CA (US); **Dong-Hwa Heo**, Seoul (KR)
(73) Assignee: **Amplify Surgical, Inc.**, Irvine, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.
(21) Appl. No.: **18/073,364**
(22) Filed: **Dec. 1, 2022**
(51) **Int. Cl.**
A61B 17/00 (2006.01)
A61B 17/02 (2006.01)
(52) **U.S. Cl.**
CPC ***A61B 17/00234*** (2013.01); ***A61B 17/0218*** (2013.01); *A61B 2017/00238* (2013.01)
(58) **Field of Classification Search**
CPC A61B 17/3421; A61B 17/7074
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,486,505 A 12/1969 Morrison
5,171,279 A 12/1992 Mathews
5,390,683 A 2/1995 Pisharodi
5,437,637 A 8/1995 Lieber et al.
5,690,222 A 11/1997 Peters
5,762,629 A 6/1998 Kambin
5,782,832 A 7/1998 Larsen et al.
5,846,182 A 12/1998 Wolcott
5,888,223 A 3/1999 Bray
6,126,689 A 10/2000 Brett
6,162,170 A 12/2000 Foley et al.
6,548,058 B1 2/2002 Melkent et al.
6,690,766 B1 6/2002 Brett
(Continued)

FOREIGN PATENT DOCUMENTS

CN 105636555 A 6/2016
EP 3016617 A2 5/2016
(Continued)

OTHER PUBLICATIONS

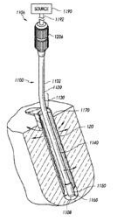
Choi, Chang Myong et al. "How I do it? Biportal endoscopic spinal surgery (BESS) for treatment of lumbar spinal stenosis." Acta Neurochir (2016) 158:459-463; published Jan. 18, 2016.
(Continued)

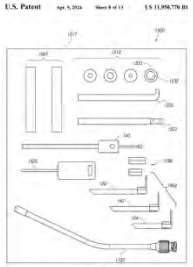
Primary Examiner — Andrew Yang
(74) *Attorney, Agent, or Firm* — Perkins Coie LLP

(57) **ABSTRACT**

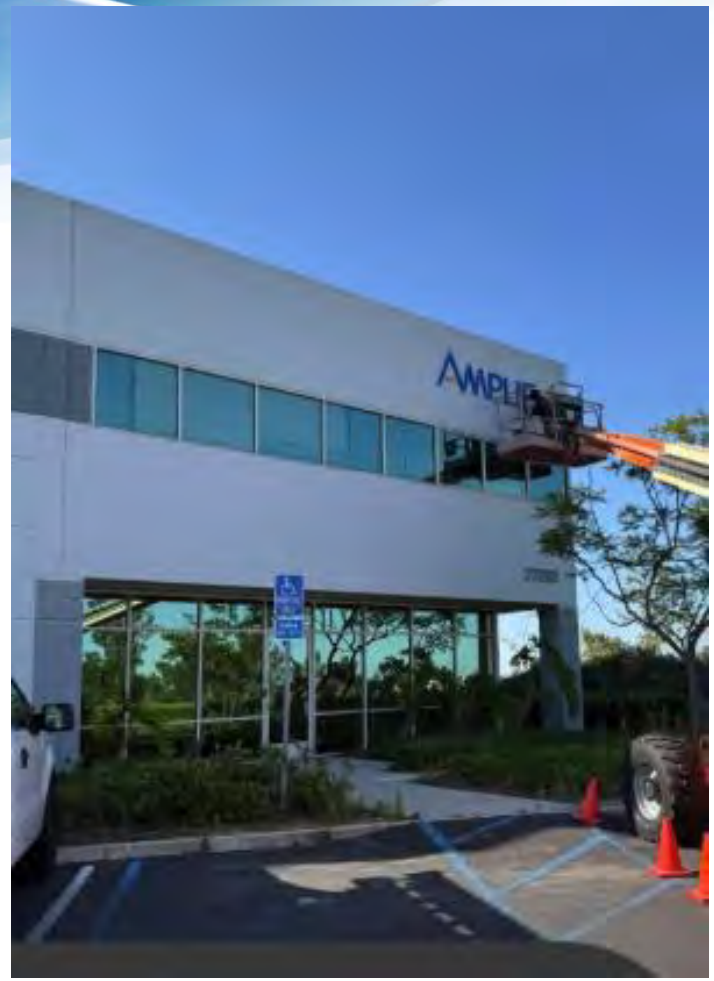
A multi-portal method for treating a subject's spine includes distracting adjacent vertebrae using a distraction instrument positioned at a first entrance along the subject to enlarge an intervertebral space between the adjacent vertebrae. An interbody fusion implant can be delivered into the enlarged intervertebral space. The interbody fusion implant can be positioned directly between vertebral bodies of the adjacent vertebrae while endoscopically viewing the interbody fusion implant using an endoscopic instrument. The patient's spine can be visualized using endoscopic techniques to view, for example, the spine, tissue, instruments and implants before, during, and after implantation, or the like. The visualization can help a physician throughout the surgical procedure to improve patient outcome.

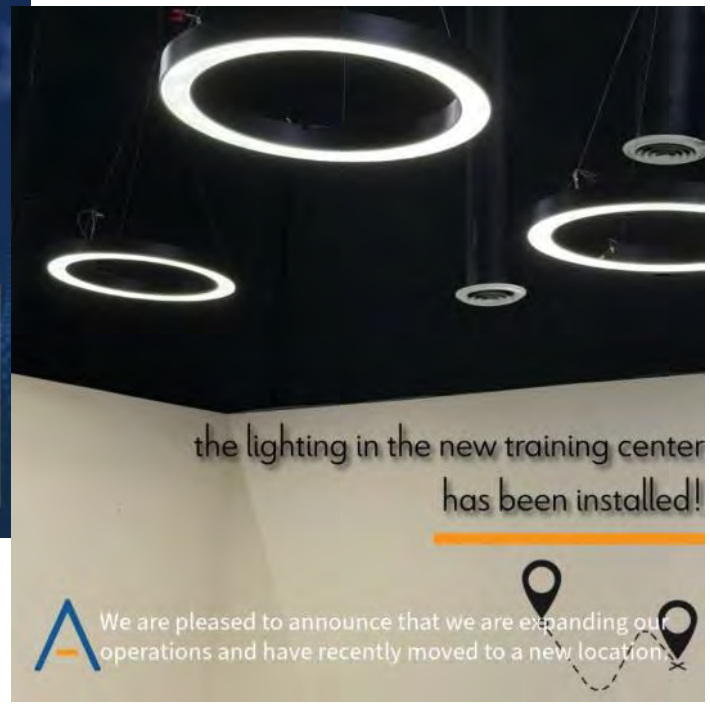
29 Claims, 13 Drawing Sheets





The dualPortal Training Institute





The dualPortal Value

- Vast amounts of training and clinical reference resources including access to the biggest network of KOLs and the latest procedural innovations.
  - Annual Endo Symposium & dualPortal US TOUR
  - Regional labs – 60 labs in 2024
  - DTI – dualPortal Training Institute in Irvine, CA
  - Advance training trips to S. Korea
  - KOL-surgery observation/mentorship programs in US and Korea
  - Latest technique updates from the experts in Korea and US
- The most advanced technologies available in the US with easy to use products that gets updated for free as they become available in the future
- The most dependable and continuous support system both from the HQ and local sales/tech representatives.

Cost effectiveness of dualPortal

1. Overall, hospital savings via less LOS, less complications, higher patient satisfaction (publication below)
2. More patient flow via marketing of endo solutions
3. Flexible ways to maximize discount with Amplify
    - Rebate systems tied to implant/dualX cage usage
    - Volume discount
    - Endo fusion related discounts
    - Discounts on disposables tied to one time capital purchase

https://thejns.org/spine/view/journals/j-neurosurg-spine/40/1/article-p77.xml

1. Endoscopic procedures were more costly for hospitals, with disposable supplies accounting for 31.7% of the total cost of cases, compared to 10.1% of the cost for open procedures.

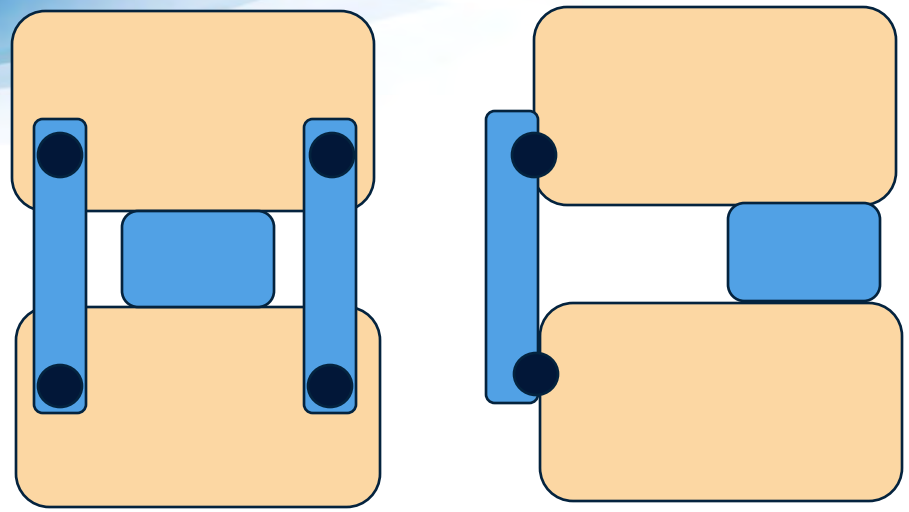
2. A multivariate linear regression independently associated endoscopic procedures with higher total costs.

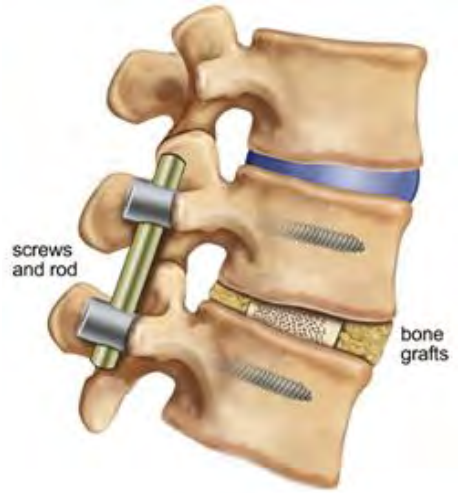
3. Patients who underwent the open procedures had longer hospital stays, at 1.4 days on average, compared to 0.7 day for patients who underwent the endoscopic procedure.

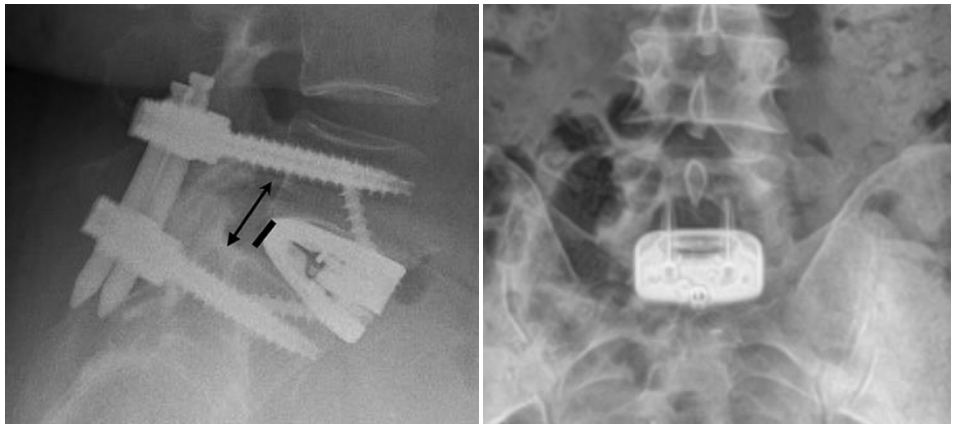
4. Nearly 8% of patients who underwent the open procedure reported perioperative complications, compared to 3.1% of the endoscopic patients.

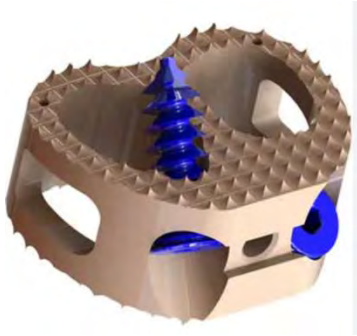
•

The Cage Dilemma

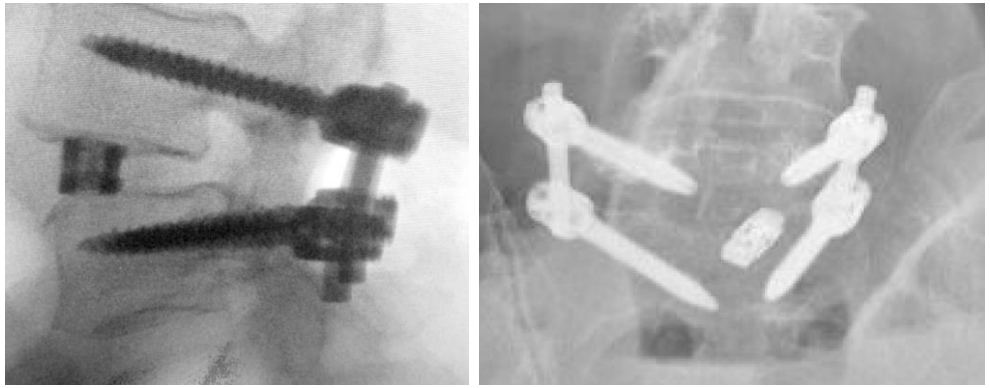






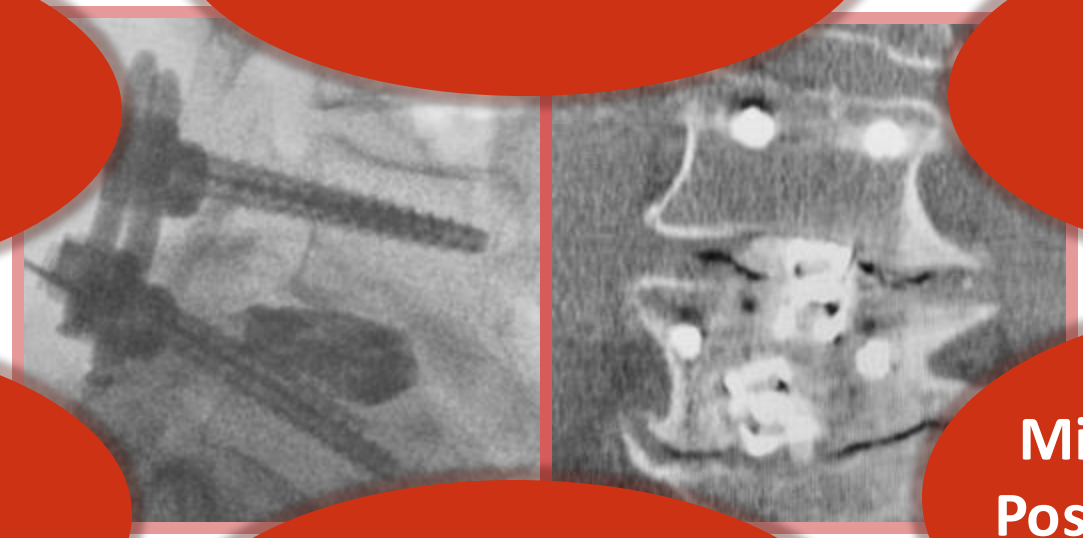


ALIF



TLIF

dualX: Designed to Solve Key Challenges of Expandable Interbody Devices



Risk of Subsidence

No Expandable for ALIF & OLIF/ATP

Post-operative Collapse

Risks of Excessive Psoas Retraction

Minimal Volume of Post-Expansion Bone Grafting

Difficult to Revise/Reposition Implant

High Subsidence / Collapse Risk with Uni-directional Expandable Cages

JNS JOURNAL OF NEUROSURGERY
OFFICIAL JOURNALS OF THE AANS SINCE 1944

Journal of Neurosurgical Spine, 2020 Nov 13: 1-10

The incidence of cage subsidence was higher in the expandable group (19.7% vs 5.4%, p = 0.0017). Within the expandable group, the unilateral facetectomy-only subgroup had a 5.6 times higher subsidence rate than the PCO subgroup (26.8% vs 4.8%, p = 0.04). Four expandable cages collapsed over time.

dualX Broad Footprint Mitigates the Risk of Subsidence

Long-term radiographic outcomes of expandable versus static cages in transforaminal lumbar interbody fusion

Chih-Chang Chang [1 2 3 4], Dean Chou [1], Brenton Pennicooke [1], Joshua Rivera [5], Lee A Tan [1], Sigurd Berven [6], Praveen V Mummaneni [1]

Affiliations + expand

PMID: 33186902 DOI: 10.3171/2020.6.SPINE191378

Abstract

Objective: Potential advantages of using expandable versus static cages during transforaminal lumbar interbody fusion (TLIF) are not fully established. The authors aimed to compare the long-term radiographic outcomes of expandable versus static TLIF cages.

Methods: A retrospective review of 1- and 2-level TLIFs over a 10-year period with expandable and static cages was performed at the University of California, San Francisco. Patients with posterior column osteotomy (PCO) were subdivided. Fusion assessment, cage subsidence, anterior and posterior disc height, foraminal dimensions, pelvic incidence (PI), segmental lordosis (SL), lumbar lordosis (LL), pelvic incidence-lumbar lordosis mismatch (PI-LL), pelvic tilt (PT), sacral slope (SS), and sagittal vertical axis (SVA) were assessed.

Results: A consecutive series of 178 patients (with a total of 210 levels) who underwent TLIF using either static (148 levels) or expandable cages (62 levels) was reviewed. The mean patient age was 60.3 ± 11.5 years and 62.8 ± 14.1 years for the static and expandable cage groups, respectively. The mean follow-up was 42.9 ± 29.4 months for the static cage group and 27.6 ± 14.1 months for the expandable cage group. Within the 1-level TLIF group, the SL and PI-LL improved with statistical significance regardless of whether PCO was performed; however, the static group with PCOs also had statistically significant improvement in LL and SVA. The expandable cage with PCO subgroup had significant improvement in SL only. All of the foraminal parameters improved with statistical significance, regardless of the type of cages used; however, the expandable cage group had greater improvement in disc height restoration. The incidence of cage subsidence was higher in the expandable group (19.7% vs 5.4%, p = 0.0017). Within the expandable group, the unilateral facetectomy-only subgroup had a 5.6 times higher subsidence rate than the PCO subgroup (26.8% vs 4.8%, p = 0.04). Four expandable cages collapsed over time.

Conclusions: Expandable TLIF cages may initially restore disc height better than static cages, but they also have higher rates of subsidence. Unilateral facetectomy alone may result in more subsidence with expandable cages than using bilateral PCO, potentially because of insufficient facet release. Although expandable cages may have more power to induce lordosis and restore disc height than static cages, subsidence and endplate violation may negate any significant gains compared to static cages.

Post Operative Collapse/Loss of Height Uni-directional Expandable Cages

JNS JOURNAL OF NEUROSURGERY
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Journal of Neurosurgical Spine, 2020 Nov 13: 1-10

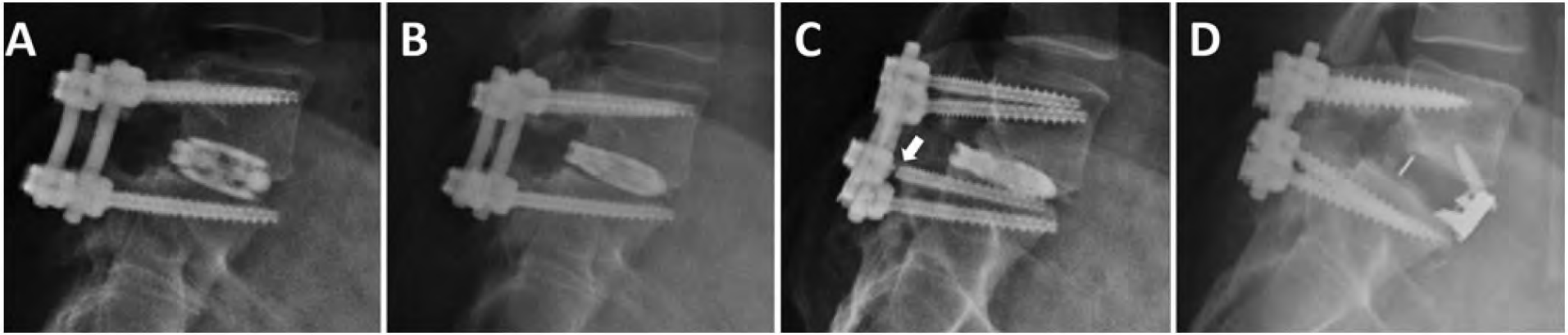
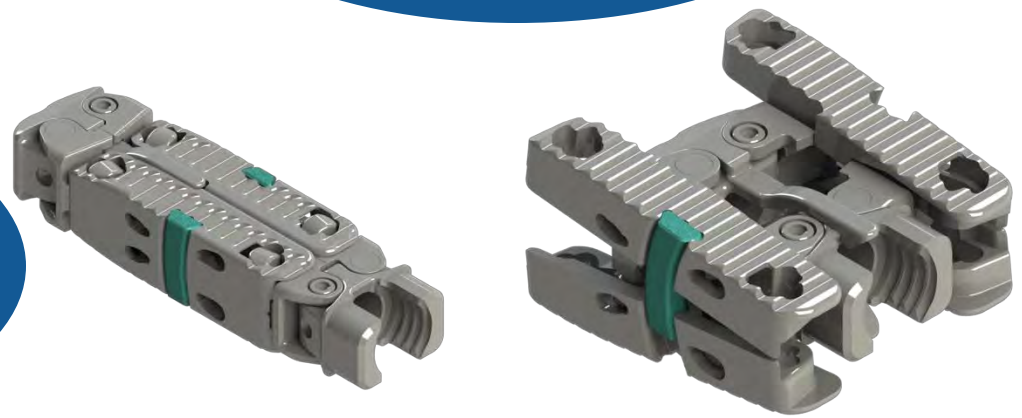


FIG. 3. Lateral radiographs 1 month after TLIF with an expandable cage (**A**), 12 months after TLIF with an expandable cage demonstrating cage collapse/loss of height of the cage (**B**), 40 months after TLIF demonstrating pseudarthrosis and screw fracture (*arrow*; **C**), and after revision surgery with anterior lumbar interbody fusion as well as posterior screw-rod replacement, demonstrating solid fusion (**D**).

dualX TLIF cage: A Revolution in Expandable Interbody Devices

Minimize Subsidence – Wide Horizontal Expansion Largest Footprint

trueLordosis™
8°, 12°, 15°, 18°*



Long Term Durability, Stability
– Two Independent Locking Mechanisms

Highest Post-Expansion Graft Volume Delivery

AMPLIFY™ SURGICAL

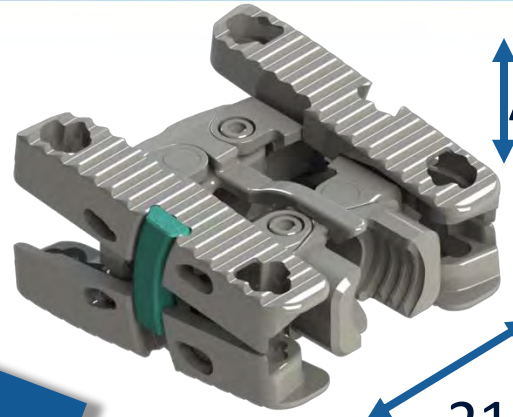
dualX – The Largest Footprint Expandable Cage

Safe and Secure

- Minimize subsidence due to wide footprint
- Only implant that provides wide horizontal expansion followed by powerful vertical expansion
- Allows for completely endoscopic placement

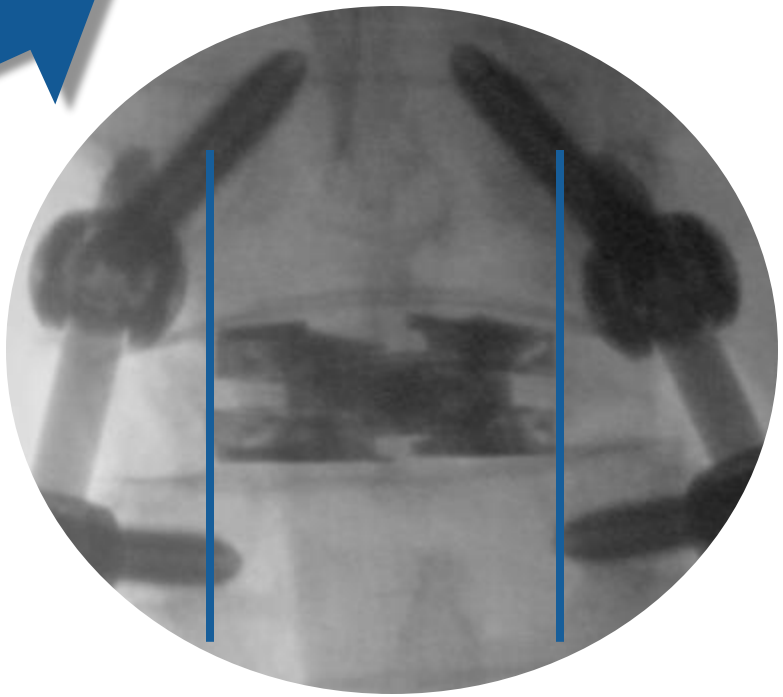
10mm

110% Increase in Width



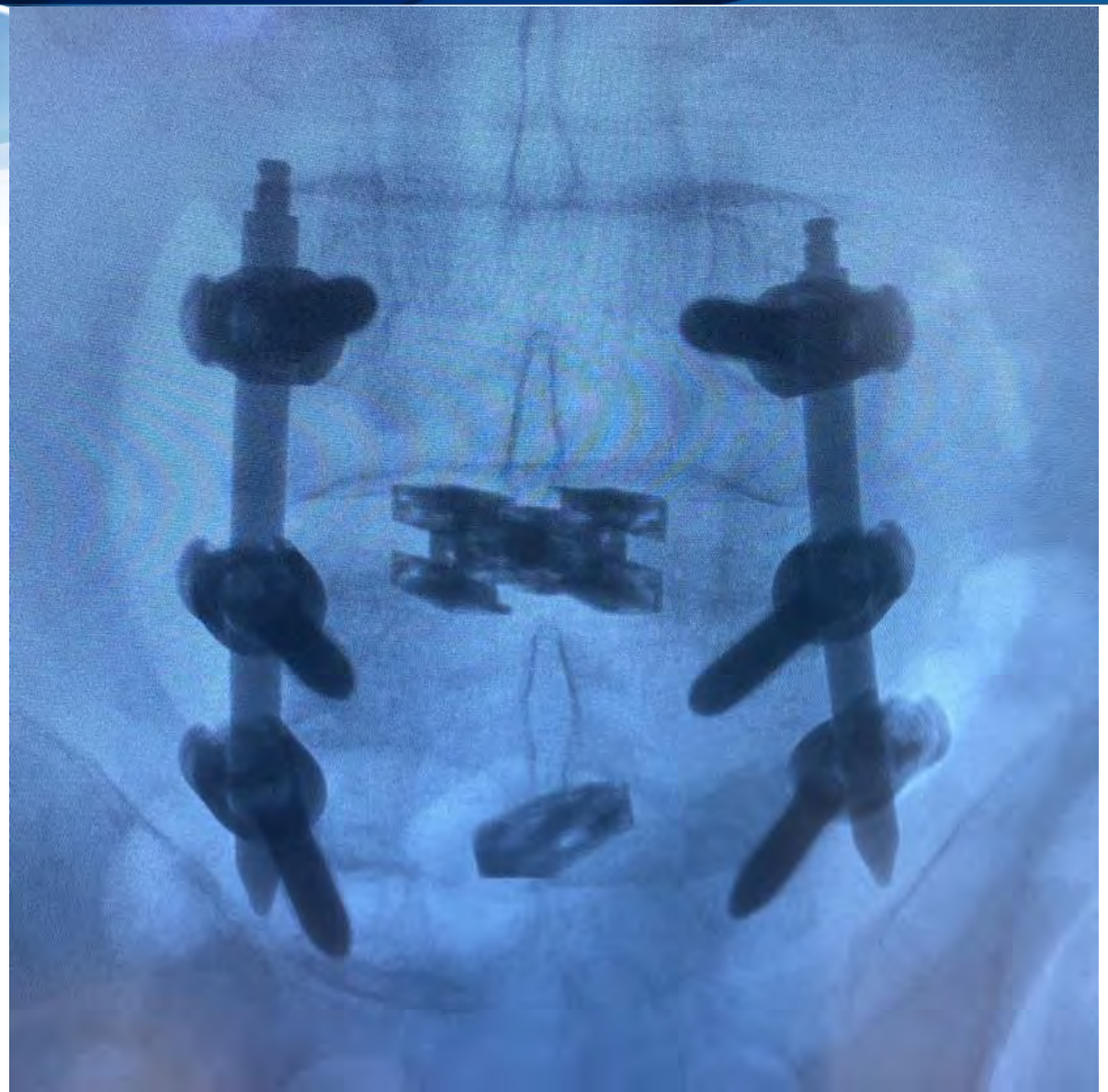
Δ3mm

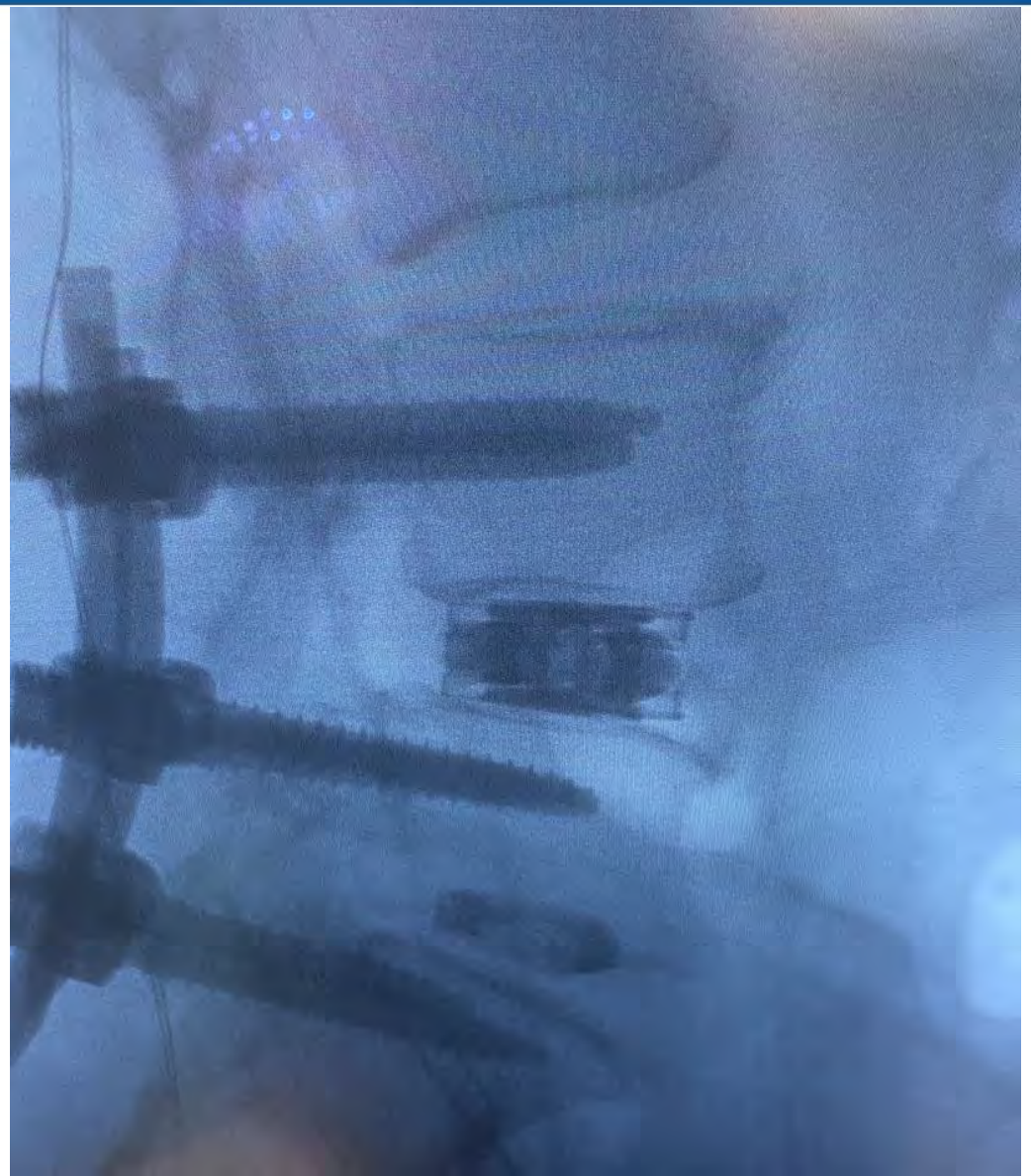
21mm



"….like you're performing an ALIF through the back!.."

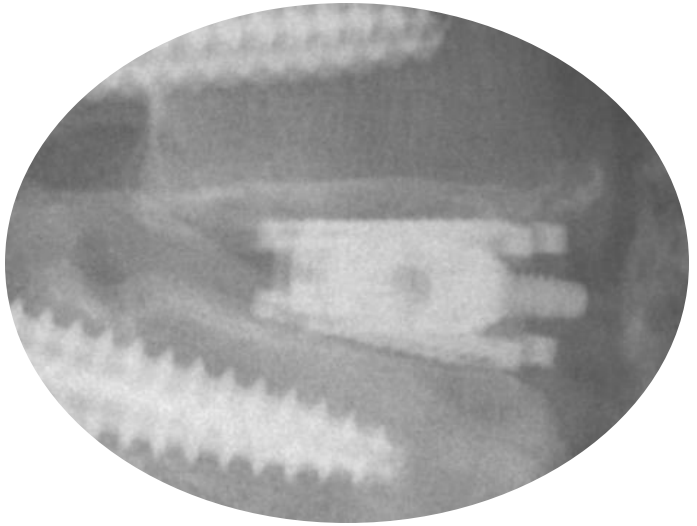
ALIF-like TLIF

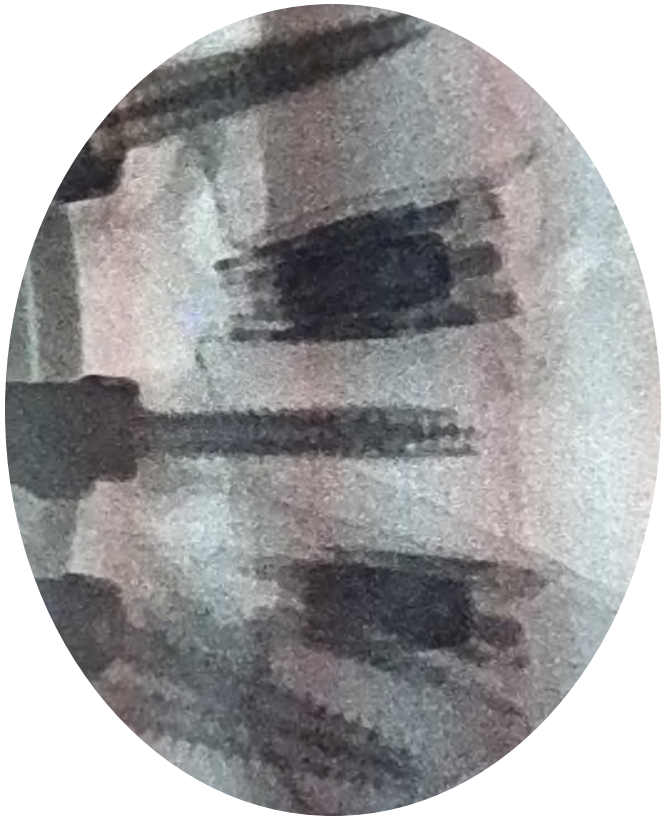




trueLordosis™

- The Implant will always provide the prescribed Lordosis
- Available in **8°, 12°, 15°, 18°***





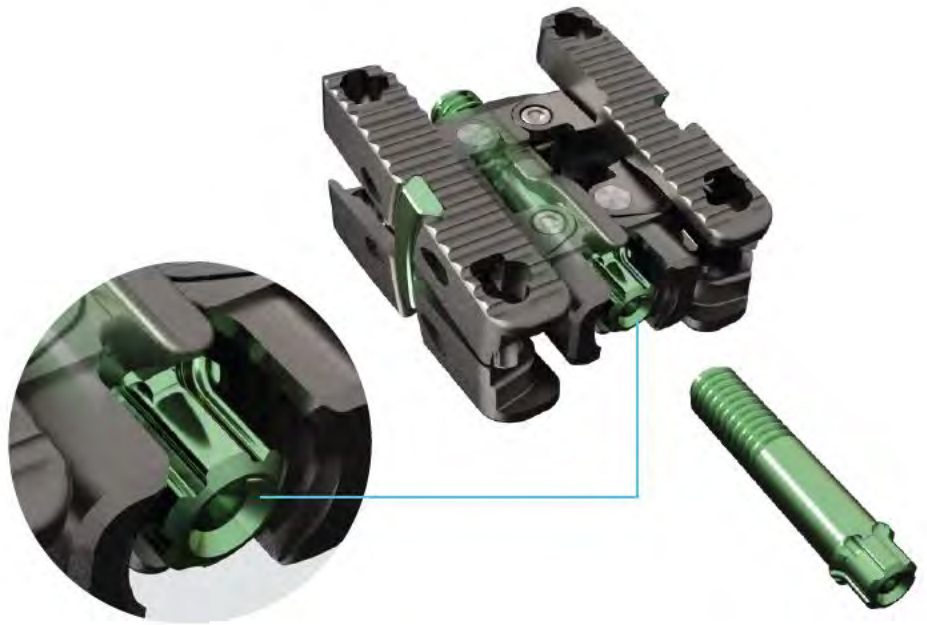
dualX – Long Term Durability and Inherent Stability

Ensures Durability and Stability with Two Independent Locking Mechanisms

dual Locking

Expansion Locking Mechanism + Secondary Screw Lockout

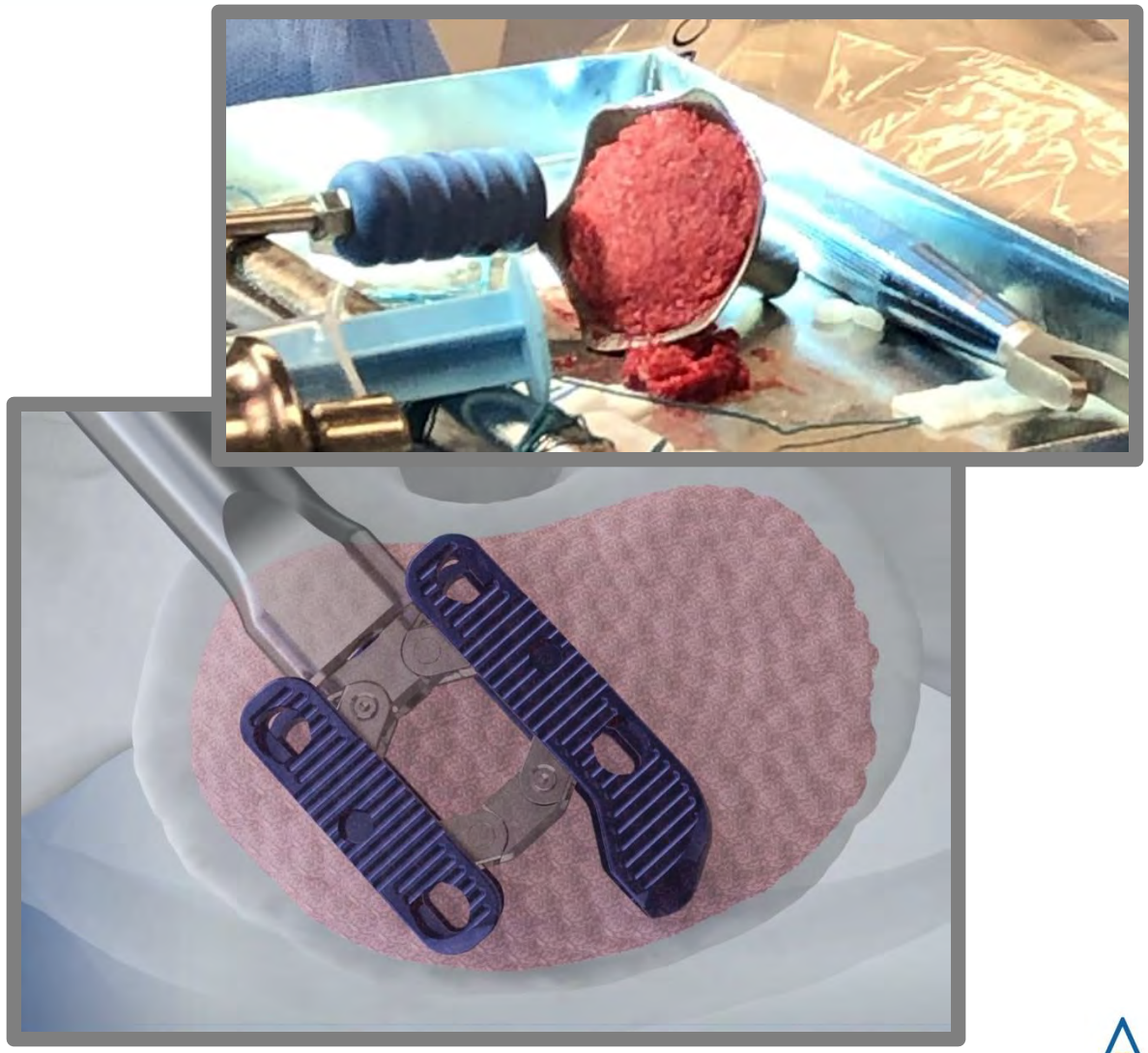
- Innovative dual locking design
  - Maintains the integrity of the implant until the patient is fused
- Final locking screw
  - Ensures implant stays expanded in width and height
- The only one of two “non-screw based” Expansion Mechanism



Post-expansion, Surgeon Preferred Bone Grafting

Maximize Bone Graft Delivery

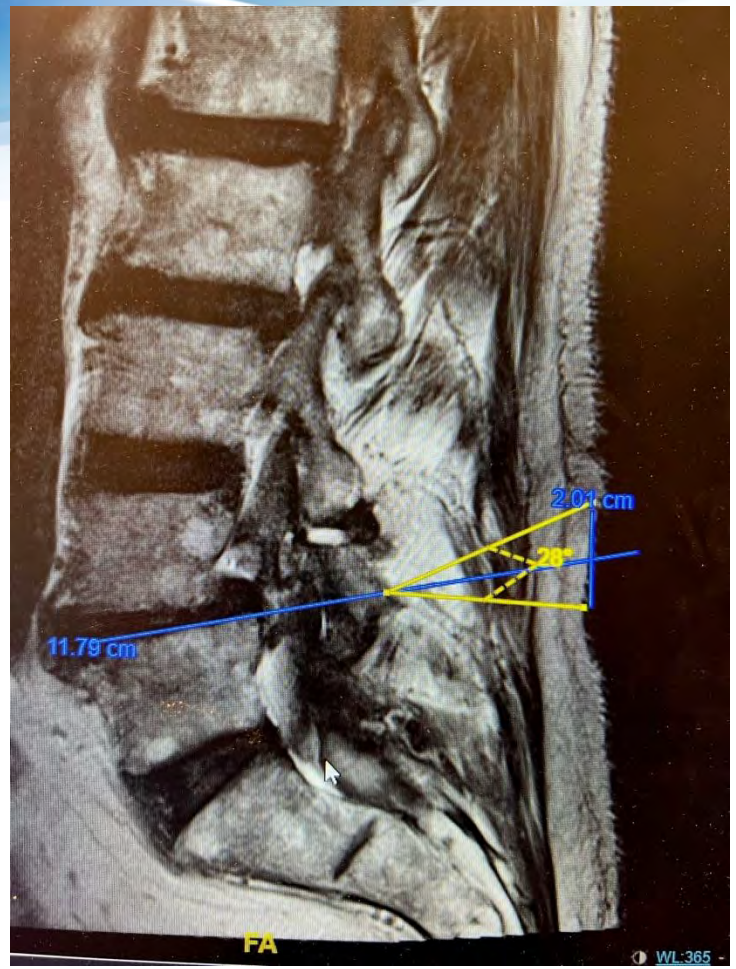
- Integrated Post Packing Through Delivery Handle
- Large Internal Atrium Retains Extensive Bone Graft Volume
- Unique “Open Structure” Enables Bone Graft to Flow Beyond Cage and Fill Entire Disc Space

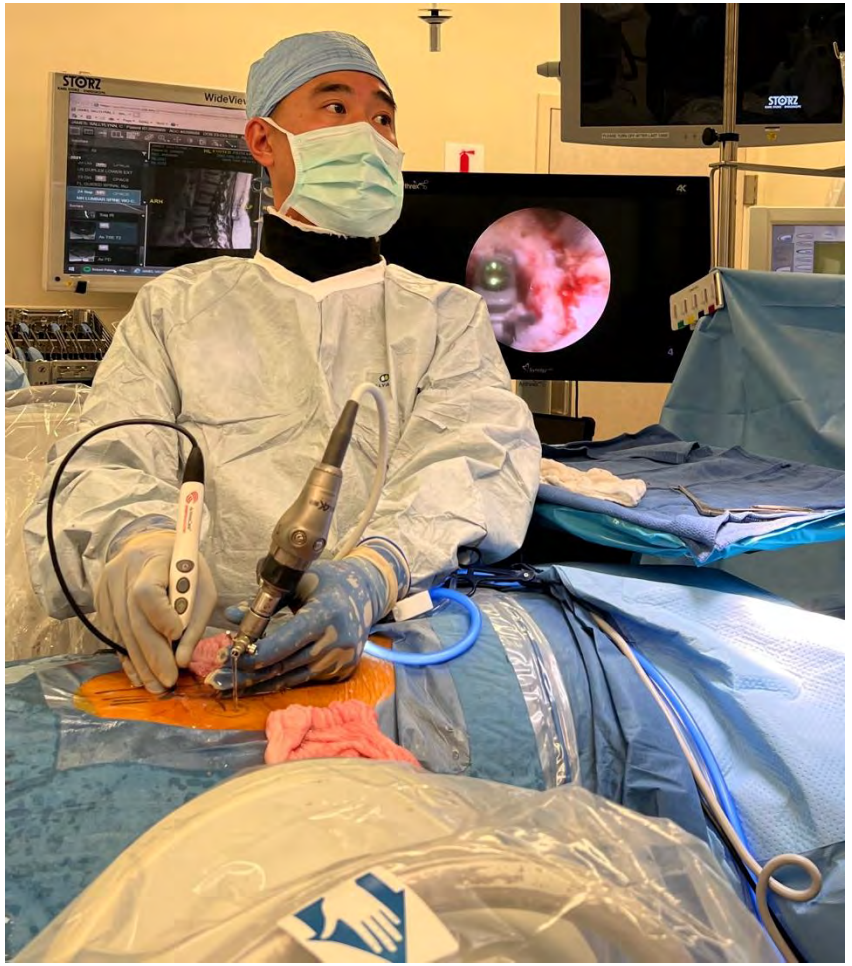


AMPLIFY®
SURGICAL

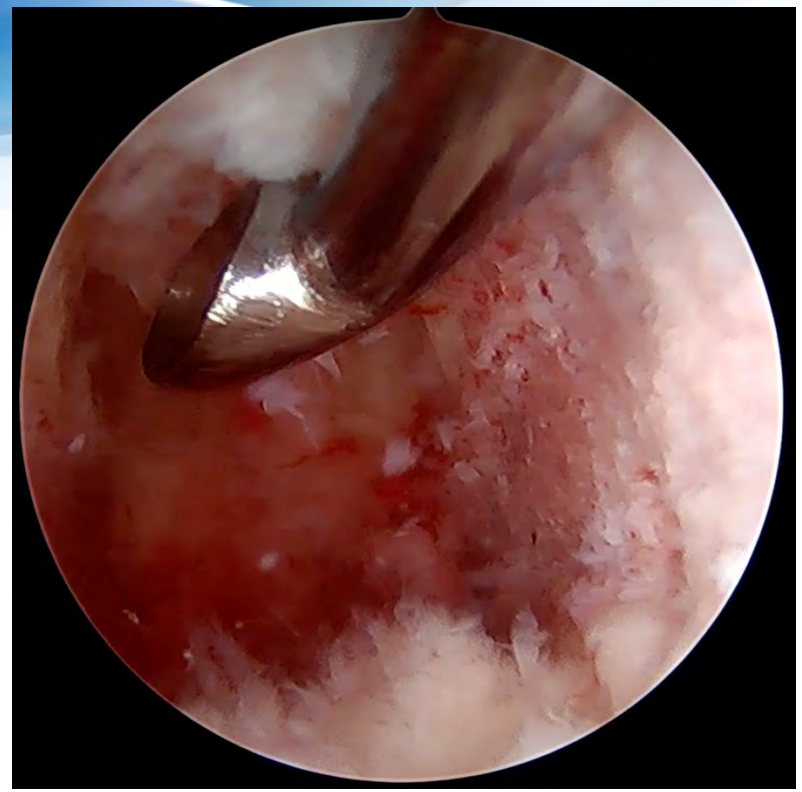
dualX® Slim

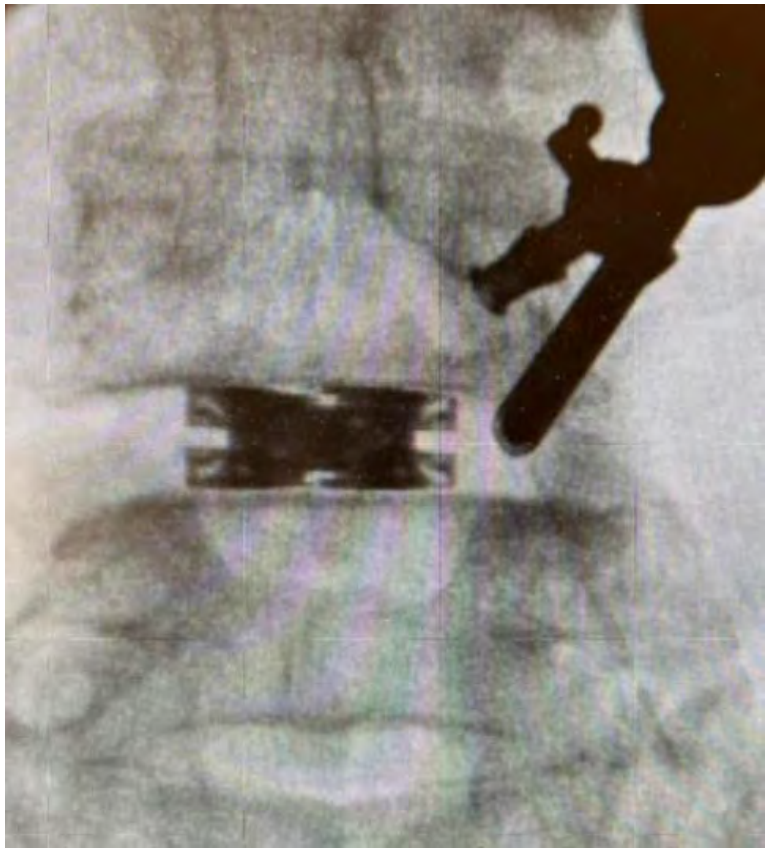
dualPortal Fusion / dualLIF

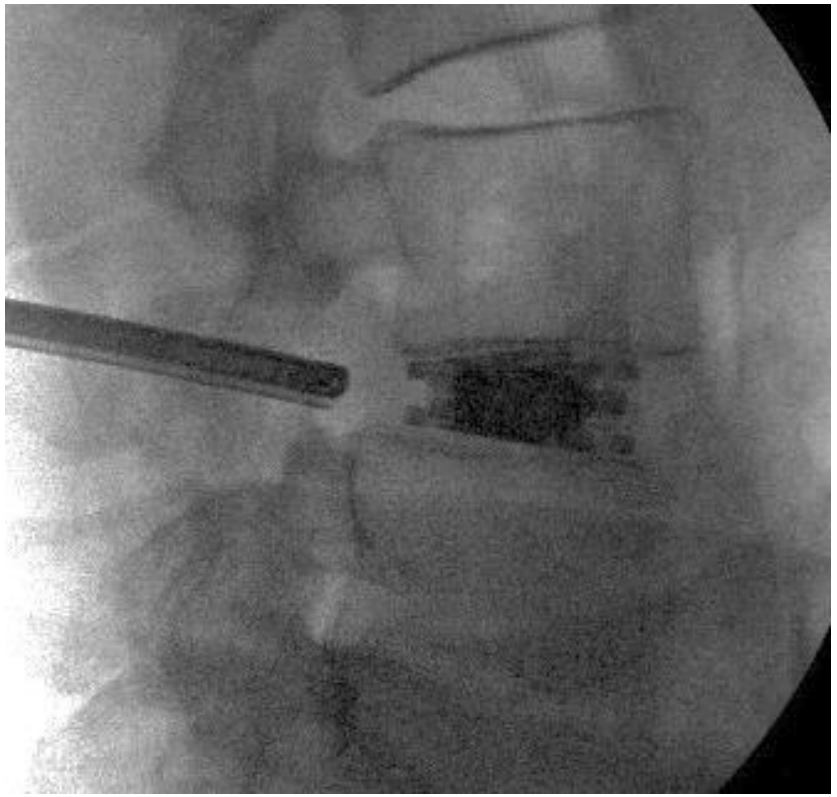




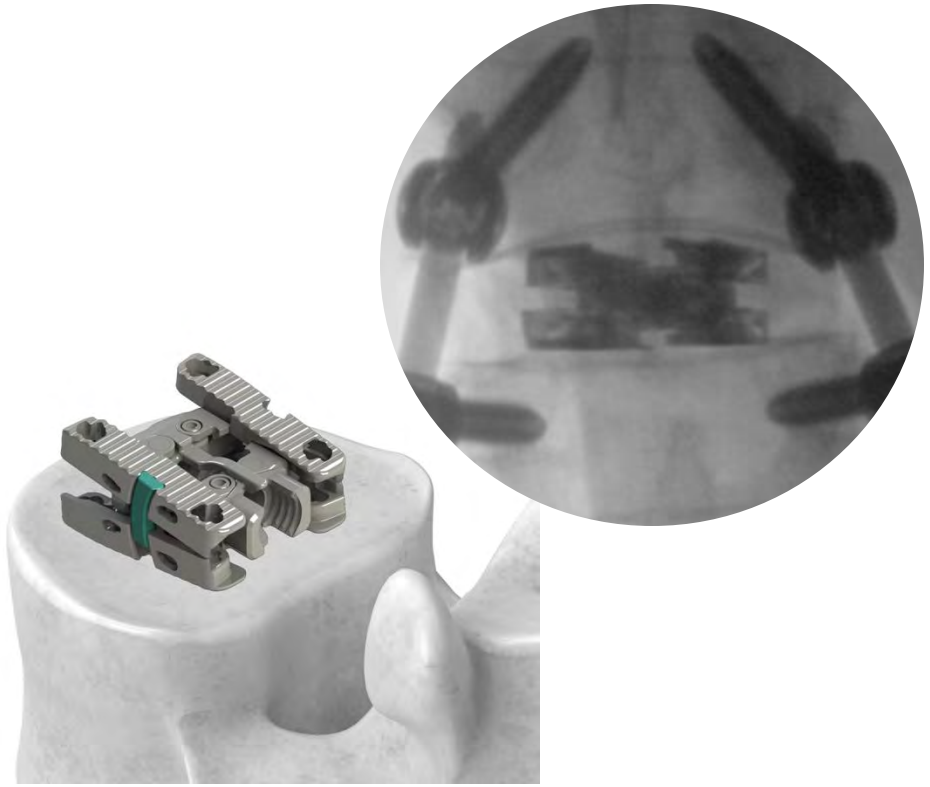
dualPortal Fusion / dualLIF







dualLIF®



dualPortal® + dualX®

dual LIF

Market Leading, Differentiated Benefits

	AMPLIFY SURGICAL	Accelus	Globus	Medtronic	Nuvasive
Bi-Directional Expansion					
Large Footprint					
Largest Footprint Size (WxL) (vs. height expanding devices)	**21x22/27mm**	14x29	12x30	10x32	11x36
Significant Volume for Internal Bone Graft Filling					
Dual Locking Safety					
Solution to Minimize Psoas Retraction (LLIFs)					
All Titanium Solution and Adaptable for 3D Printing					

dualX LLIF with Small Portal Access

dualX®

Dual Expanding Interbody Fusion System

LLIF

LATERAL LUMBAR INTERBODY FUSION

dualX® transforms the fusion environment from insertion to spinal restoration by delivering a powerful **dual-expanding** implant through a minimally invasive approach.

SMALL PORTAL ACCESS SYSTEM

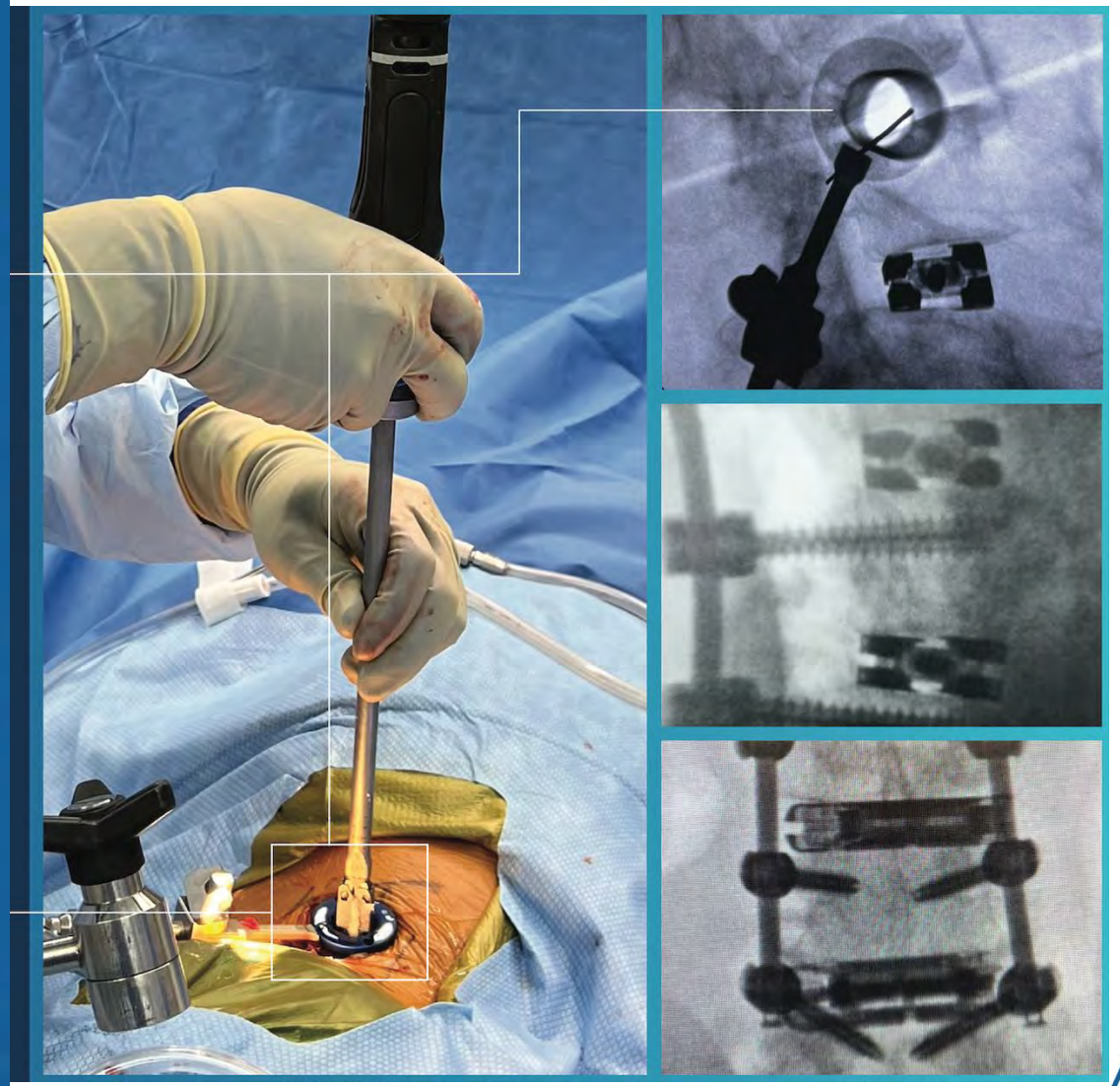
Designed to minimize neural retraction while still achieving maximum implant geometry (22m width, expanded).

dualX® LLIF

- Wide, horizontal expansion engineered to reduce subsidence risk.
- Powerful vertical expansion restores disc height for decompression.
- Highest amount of post-expansion, surgeon-preferred bone grafting.
- Innovative dual-locking mechanism designed to maintain integrity of implant.

Available at **0°, 7°, and 12°** lordotic angles for sagittal alignment restoration.

AMPLIFY SURGICAL



dualX –A New LLIF Leader

Today…

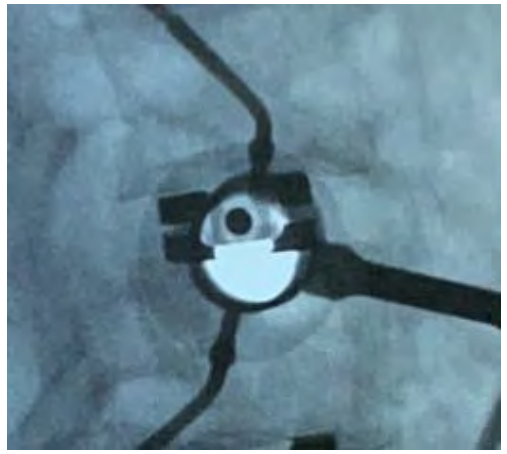
<40% of Surgeons Practice LLIF

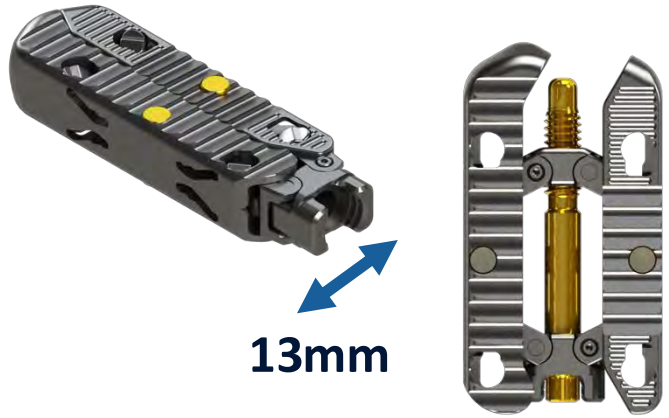
- Want to avoid post-op complications
  - 30% incidence
- Overstretching psoas
  - 30mm+ retraction required
- No other devices solve issue
- Nuvasive dominates the market

dualX LLIF Solution

Eliminates excessive psoas retraction

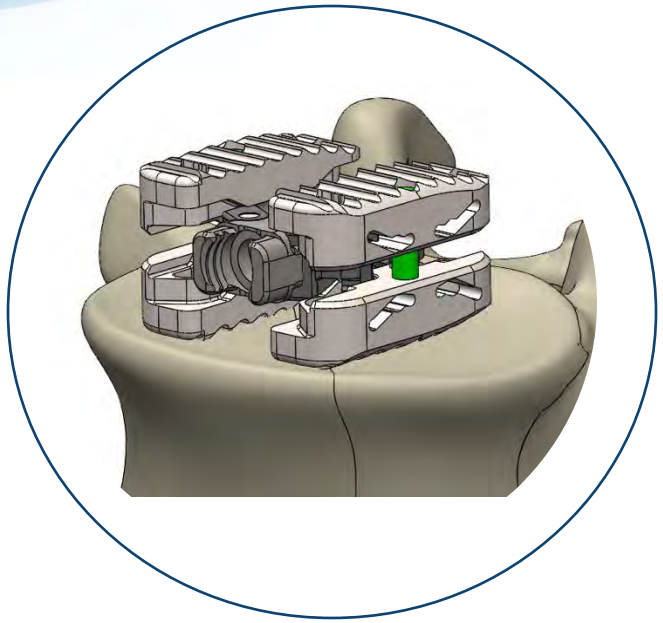
- **Safer:** Minimize thigh related complications
- **Faster:** Simpler set-up, less intra-op X-rays
- **Economic:** Low-cost retractor tube





dualX ALIF / ATP: FDA Cleared

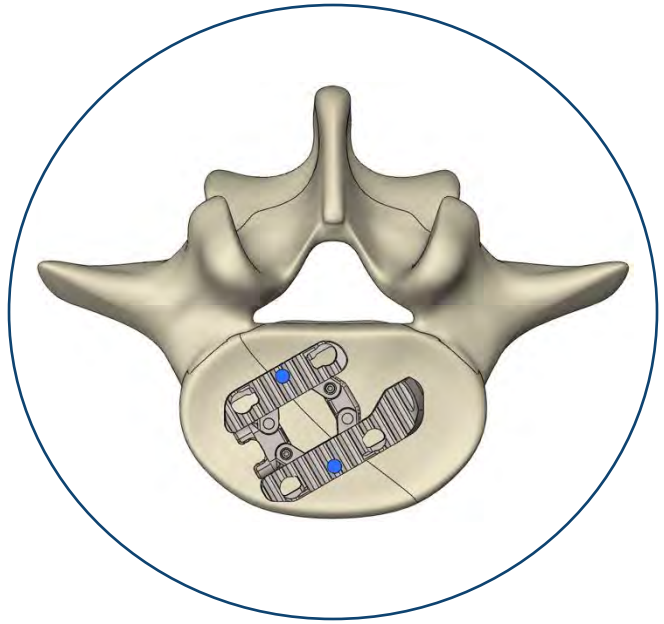
Anterior Dual-Expanding Interbody



Designed to Minimize
Retraction of Major Vessels (L3/4, L4/5)

FDA
Cleared

ATP Dual-Expanding Interbody

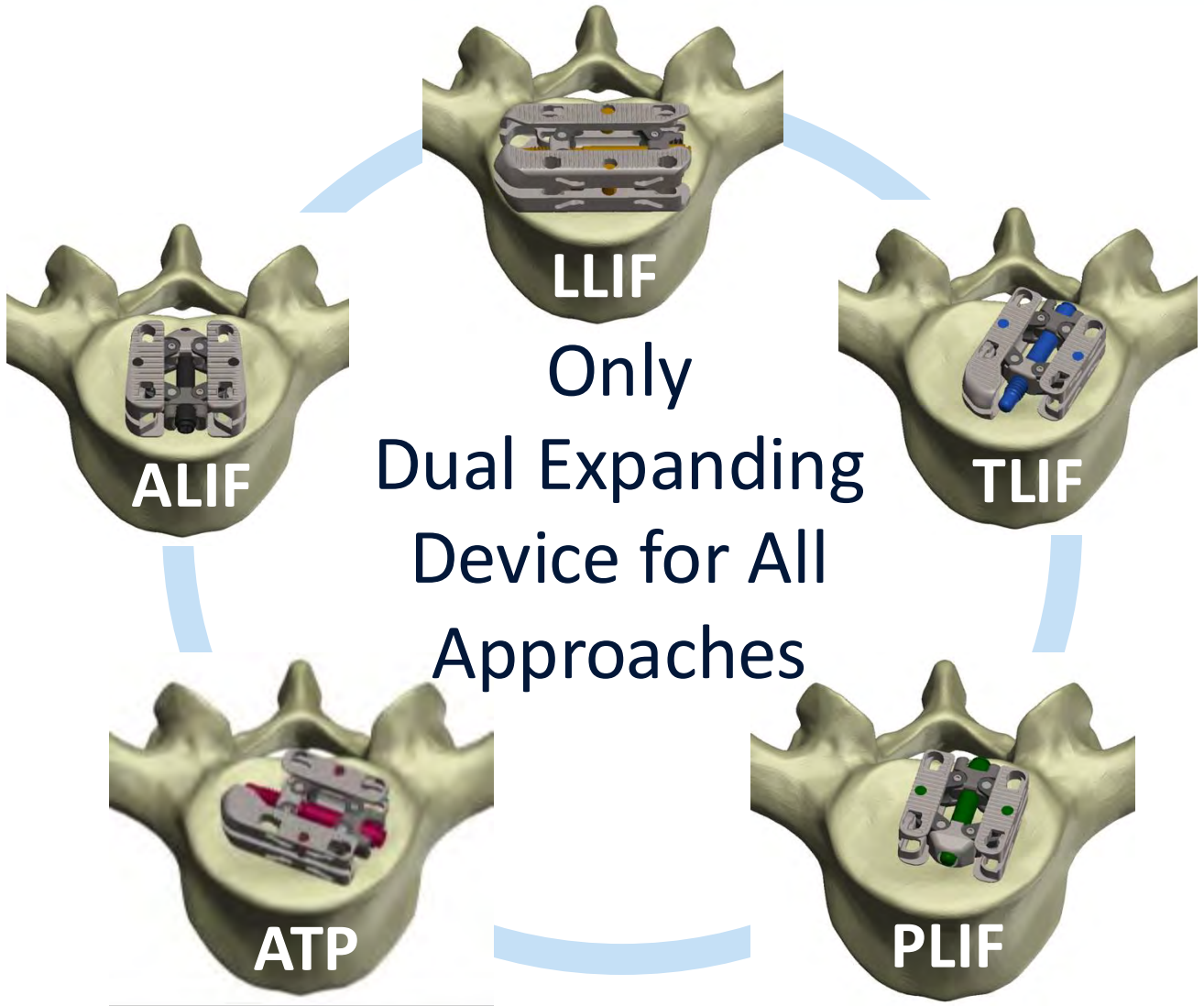


- ATP-specific Lordosis
- Only Cage Specifically Shaped for ATP
  - Safer access through dangerous anatomy
  - Application for endoscopic access
- Obviates Need to Conduct Orthogonal Sweep
  - Less trauma to the Psoas

Expanding the Opportunity for MISS Surgery

dualX®

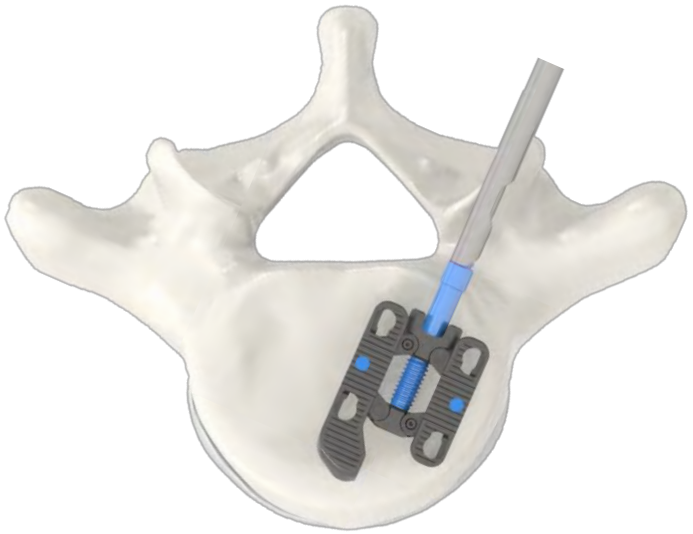
Dual Expanding Interbody Fusion System



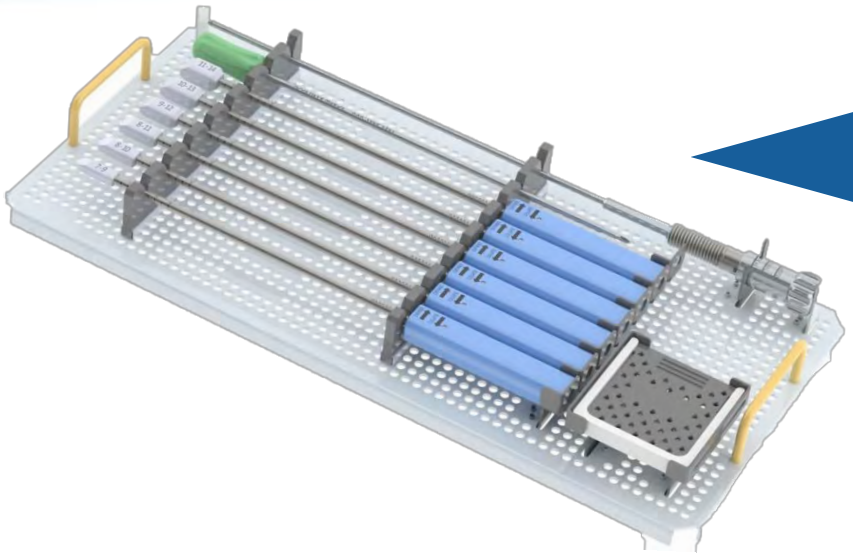
Instrument Simplicity & Safety

- All steps performed safely through a single inserter
  - Insertion
  - Lateral expansion
  - Vertical expansion
  - Graft filling
  - Screw lock out

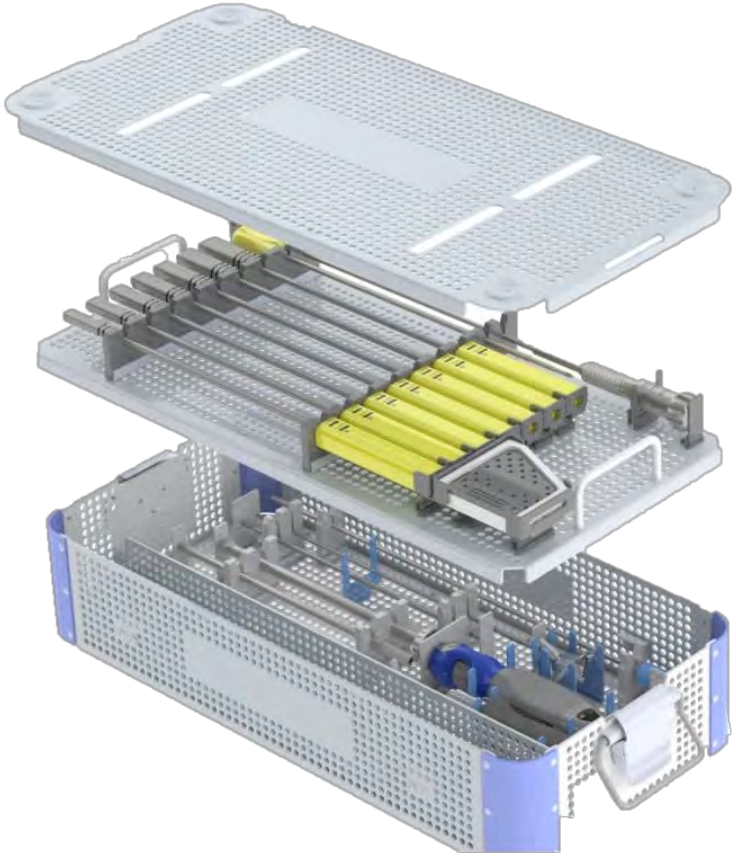
Common, Familiar Inserter for Every Surgical Approach



One Instrument Set for All Five dualX Systems



Simply Swap Top Tray



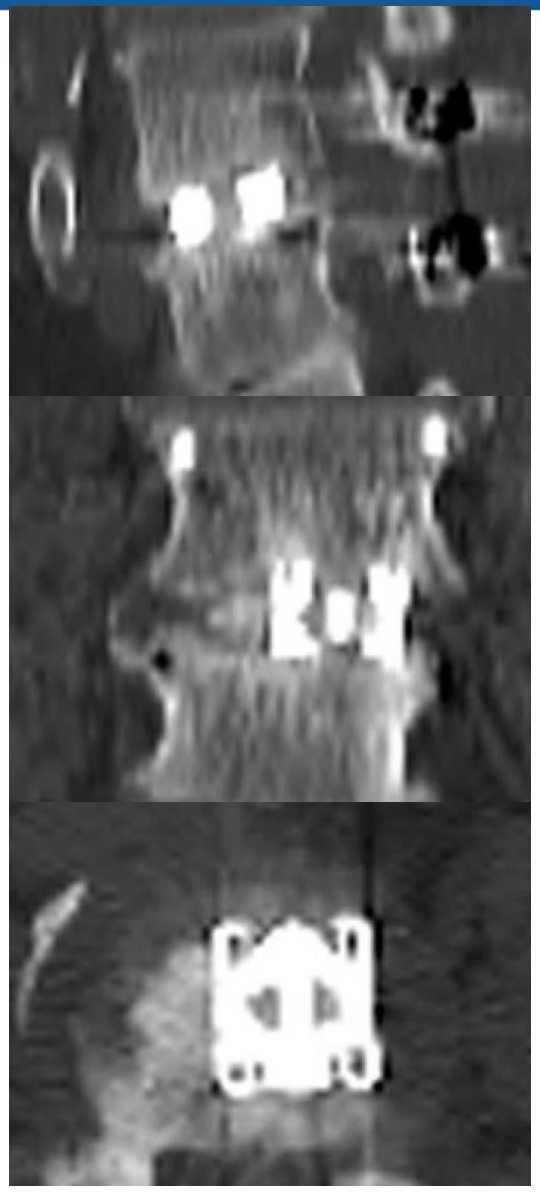
Surgeon Experience the Benefits of dualX

*"I have **done over 60 levels** with the entire range of Amplify cages.... I **have not had to revise any** and **all that are beyond 6 months post op are considered fused** without any signs of non-union.*

- Surgeon from AZ

*I've **used about 100 cages so far** with lots of follow-ups past 12-18+ months. The **footprint is impressive. Much more stable and haven't seen any subsidence.** The **larger footprint helps,** and **more stability helps with post-op pain.** It also **provides impressive power to correct deformity.***

- Surgeon from IA



Building Clinical Momentum

- Operating in over 25 states

March 29 | UCI Health | 7:00 AM

AMPLIFY SURGICAL

4th Annual Endoscopic Spine Symposium featuring dualPortal &dualX technologies

Register: https://amplifysurgical.com/4th-annual-symposium/

Symposium Faculty

Questions: marketing@amplifysurgical.com

AMPLIFY SURGICAL

4th Annual Amplify Surgical Endoscopic Symposium

Featuring dualPortal & dualX technologies

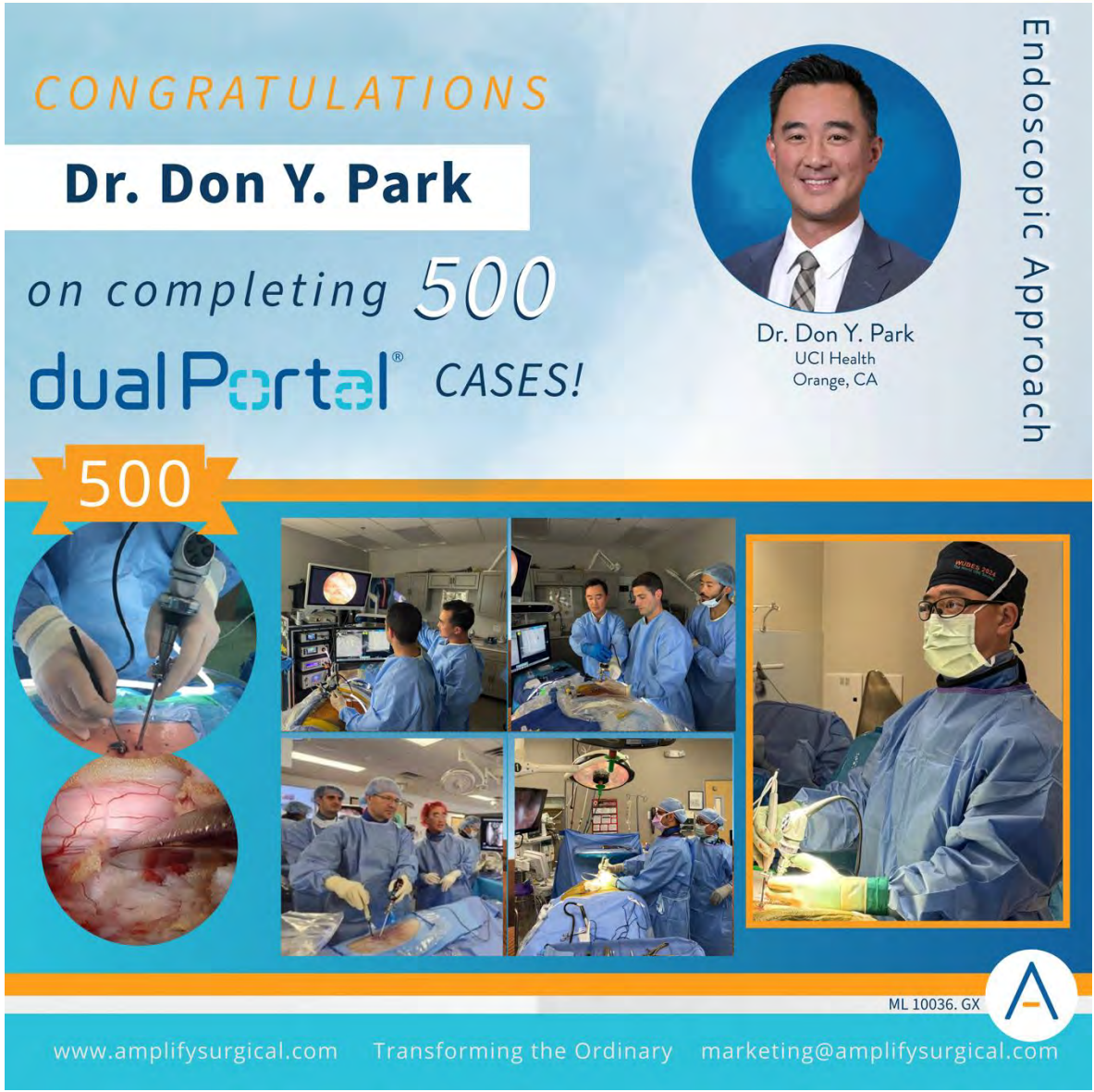
SAT. MARCH 29, 2025

Register Here:
amplifysurgical.com/4th-annual-symposium/

Hands on Cadaver Workshop A multi-station and multi-session lab course

Dr. Don Park, 500th dualPortal Procedure

- *"Over the past 100 cases, I have experienced how dualPortal spinal endoscopy can push the boundaries of spine surgery to a whole different level. My practice has completely transformed due to the enhanced visualization and the shift to the outpatient ASC setting. From endoscopic discectomies to fusions, my patients have benefited so much from this enabling technique. dualPortal spinal endoscopy is the next evolution of minimally invasive spine surgery."*



dualPortal® Clinical Paper

European Spine Journal
https://doi.org/10.1007/s00586-023-07701-9

REVIEW ARTICLE

Clinical outcomes and complications after biportal endoscopic spine surgery: a comprehensive systematic review and meta-analysis of 3673 cases

Don Y. Park[1] · Alexander Upfill-Brown[1] · Nora Curtin[1] · Christopher D. Hamad[1] · Akash Shah[1] · Brian Kwon[2] · Yong H. Kim[3] · Dong Hwa Heo[4] · Cheol Woong Park[5] · William L. Sheppard[1]

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Table 2 Operative Detail

Biportal endoscopic discectomy	Biportal endoscopic decompression	Biportal endoscopic TLIF	Surgery performed at lumbar levels				
			L1-L2	L2-L3	L3-L4	L4-L5	L5-S1
1056	2402	261	2	101	351	1255	338

Table depicting the number of each surgery type performed and the lumbar levels involved in the surgeries

Our study examining **3673 cases** demonstrated that **biportal spinal endoscopy is safe and effective**. Complications are **comparable** or **less** than previously published rates with respect to open and microscopic techniques…**Significant improvement** in **VAS-Back, VAS-Leg, ODI, and Macnab Scores** were seen across the cohort.

AMPLIFY SURGICAL

Clinical Study Indicates dualPortal® Spinal Endoscopy as Successful Surgical Technique Demonstrating Favorable Patient Outcomes and Low Complication Profile

Recent clinical study indicates positive data on Amplify Surgical's dualPortal® Endoscopic Approach.

IRVINE, CA (PRWEB) - April 28, 2023

Amplify Surgical, Inc., a medical device company focused on innovative minimally-invasive surgery for the lumbar spine, announced positive data from the first comprehensive systematic review and meta-analysis on its dualPortal® Spinal Endoscopy, also known clinically as 'biportal spinal endoscopy'. The study, "Clinical Outcomes and Complications after Biportal Endoscopic Spine Surgery: A Comprehensive Systematic Review and Meta-Analysis of 3673 Cases," was recently published in the *European Spine Journal*, led by principal investigator, Don Y. Park, M.D., Vice Chair of Quality and Safety of the Department of Orthopaedic Surgery, David Geffen School of Medicine at UCLA in Los Angeles, California. Link: https://pubmed.ncbi.nlm.nih.gov/37079079/ and https://amplifysurgical.com/news/press-release-23/.

AMPLIFY SURGICAL

dualLIF® Clinical Paper

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https://doi.org/10.14245/ns.2346116.058

Neurospine
pISSN 2586-6583 eISSN 2586-6591

Original Article

The Use of Dual Direction Expandable Titanium Cage With Biportal Endoscopic Transforaminal Lumbar Interbody Fusion: A Technical Consideration With Preliminary Results

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Table 2. Clinical results

Variable	Preoperative	Postoperative		
		6 Weeks	3 Months	6 Months
VAS back*	6.9 ± 1.19	2.1 ± 1.85	1.3 ± 1.57	1.25 ± 0.63
VAS leg*	8.3 ± 1.16	0.55 ± 1.57	1.6 ± 1.65	1.0 ± 0.94
ODI*	55.2 ± 9.1	32.3 ± 17.3	29.1 ± 15.5	26.6 ± 7.5

Values are presented as mean ± standard deviation.
VAS, visual analogue scale; ODI, Oswestry Disability Index.
*$p < 0.05$.

"There was **no significant subsidence or collapse of the expandable cages** during the 6-month follow-up period. **Lumbar lordosis and disc height** were **significantly increased** after surgery. **ODI and VAS scores** were **significantly improved** at 6 months after surgery."

AMPLIFY SURGICAL

Clinical Study Demonstrates Favorable Patient Outcomes with the dualPortal® Endoscopic TLIF with dualX®, the dualLIF® System

Recent clinical study indicates positive data on Amplify Surgical's dualLIF® System, dualPortal® Endoscopic TLIF with dualX®.

IRVINE, CA (PRWEB) – April 14, 2023

Amplify Surgical, Inc., a medical device company focused on innovative minimally-invasive surgery for the lumbar spine, today announced positive data from a retrospective study on its dualLIF® System, the synthesis of dualPortal® Spinal Endoscopy and dualX® Dual-Expanding Interbody Technology. The study, "The Use of Dual Direction Expandable Titanium Cage With Biportal Endoscopic Transforaminal Lumbar Interbody Fusion: A Technical Consideration With Preliminary Results," was recently published in Neurospine, led by clinical researchers, Don Y. Park, M.D., Vice Chair of Quality and Safety of the Department of Orthopaedic Surgery, David Geffen School of Medicine at UCLA in Los Angeles, California and Dong Hwa Heo, M.D., Ph.D., Director of the Department of Neurosurgery, Spine Center, Champodonamu Spine Hospital in Seoul, South Korea.
Link: https://pubmed.ncbi.nlm.nih.gov/37016859/

AMPLIFY SURGICAL

dualPortal®

Endoscopic Approach

Shallow Learning Curve

Greater Flexibility

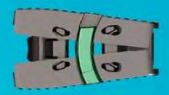
Enhanced Visualization

dualX®Slim

Dual Expanding Interbody Fusion

#easyInsertion

#wideFootprint



#trueLordosis™
8° 12° 15°

#oneStepExpansion

Transforming the Ordinary