
ATLAS

Anterior Trans-lateral Approach System

Surgical Technique



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ATLAS: Anterior Trans-lateral Approach System

History and Rationale

Lateral surgical spinal approaches were initiated in the early two-thousands as implemented by Luiz Pimenta MD. This approach was a radically novel methodology to improve and restore the structural integrity of the lumbar spine. Although a new and more advanced skill set was required to master this technique, it rapidly became a progressively growing percentage of the market share of lumbar surgery due to the benefits of its minimally invasive approach, as well as improved functionality and outcomes.

However, this was limited to L4-L5 and proximal levels due to the anatomic restrictions of the iliac crest laterally. The anatomical uniqueness of L5-S1 is due to vascular bifurcation, lumbar plexus considerations, sympathetic chain, and specific orthogonal geometric issues. This level presented a major challenge from a minimally invasive technique approach. Dr. Scott Spann envisioned a unique anatomic approach to address this challenge and went about developing and protecting his innovative methodology and system. To date, he has been granted multiple US patents¹, with more pending, forming the cornerstone of the ATLAS oblique approach to the spine.

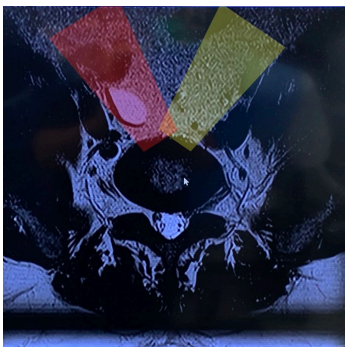
Indications For Use

To provide surgeons with surgical access to the spine by tissue and foreign body management using a minimally invasive and endoscopic procedure. The system confirms the placement and position of the retractor and its' components and provides better access as well as visualization and stabilization of the surgical site.

Preoperative Considerations

Due to a host of factors, the lumbosacral junction is the most common level of low back pathology. While there are multiple ways of reconstructing this level, we ideally want to restore anatomy to its most normal state. Therefore, disc height restoration to increase foraminal aperture, restoration of sagittal balance, as well as reduction of any translational deformity are all considerations to ultimately achieve a stabilized decompression of this anatomy. Individual patient anatomy takes on a far greater level of importance when deciding to utilize the ATLAS approach.

Patient girth is a major consideration in any approach to the spine, as has been previously noted as an advantage in lateral spine surgery. The effects of gravity on a large abdomen often makes this approach the most ideal of the considerations as it pulls the abdominal contents away from the approach region.



One must have an MRI for preoperative evaluation of the lumbar vasculature, specifically where the actual bifurcation of both the aorta and vena cava occur. It is also important to know if there is a shift of the vasculature more toward the right or towards the left as this may dictate a surgeon's choice of right or left approach. Additionally, the occurrence of a transitional vertebra can certainly impact the choice of approach.

Prior retroperitoneal surgery may be considered a

¹ US Pat. 10,716,553, US Pat. 10,085,854, US Pat. 9,451,940

contraindication, although this approach has been specifically utilized for revision purposes coming in on the contralateral side from the prior approach. It is helpful when viewing the axial images on the MRI to note if there is a plane of fat between the anterior surface of the vertebral body and the vasculature as this typically would imply an easier ability to mobilize the vasculature intraoperatively versus potential adherence of the vasculature to the spinal column. It is also reasonable to assess for vascular calcifications both from the concern of mobilization as well as creating an iatrogenic embolism. If the ureter can be assessed via the axial images, it is helpful to have this awareness, but rarely does this present itself as an intraoperative problem. There are literature reports of a relative paucity of a right iliolumbar vein and this may factor into approach choice.

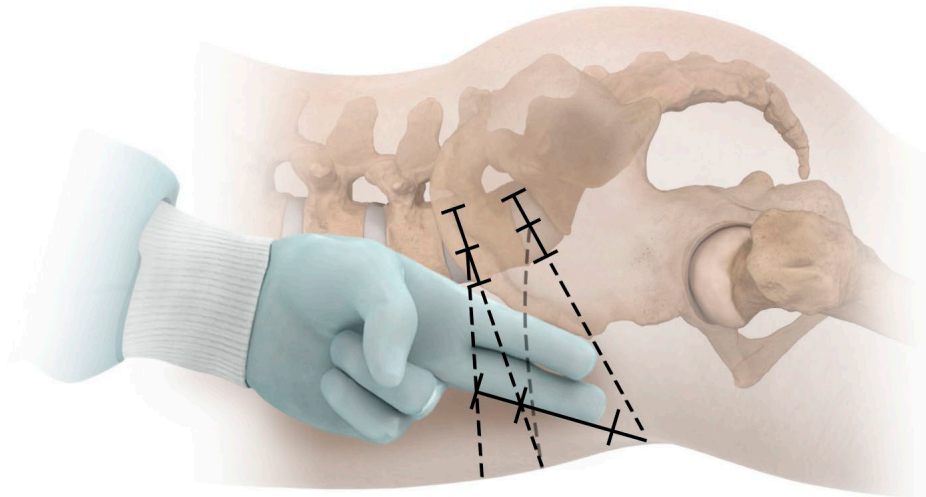
Structurally a significant collapse of the disc space as well as the often accompanying osteophytes should be noted. This is not problematic for the approach but may subsequently affect retractor placement. The presence of a sharp very high inclination of the lumbosacral level may also present significant approach challenges. A high grade olithesis should also be evaluated in choosing this approach. These concerns are brought to bear when the trajectory of retractor trial and implant placement may be restricted by the pubis.



Prepping and Positioning

In preparing these patients, there are some additional considerations. A very wide surgical prep should be carried out that effectively covers xiphoid to pubis and posterolateral to well below the inferior side of the dependent umbilicus. It is necessary to be prepared to rapidly access the vasculature in the unfortunate event of laceration.

Due to the trajectory, the pubis is a consideration in near every case. Standard lateral positioning is carried out on a flat top radiolucent table. Typically, the patient is secured to the table with tape. This approach does not mandate extending the table to create a “break in the bed.” Conversely, leaving laxity within the vasculature, the psoas and the lumbar plexus will facilitate mobilization of the structures and minimize the potential for traction injuries. Uniquely, taping of the legs is carried out at a significantly more distal aspect than traditional lateral surgery. Otherwise, tape may restrict your ability to approach this level. One should be careful to flex the hip probably no more than 30 degrees so that this is not a mechanical barrier during the approach as well. However, too much extension combined with retraction of the lumbar plexus increases the risk of postoperative neuropraxia.

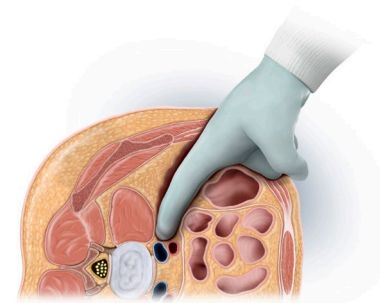
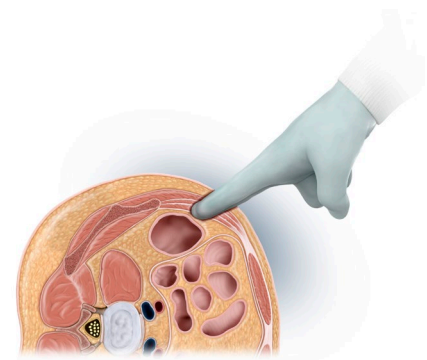


Incisional Factors

Once secured in a desired lateral decubitus position preoperative fluoroscopic imaging is carried out. Skin markings are then made that follow the alignment of the disc space from the lateral perspective as well as noting where the midline exist on a AP view.

Approach

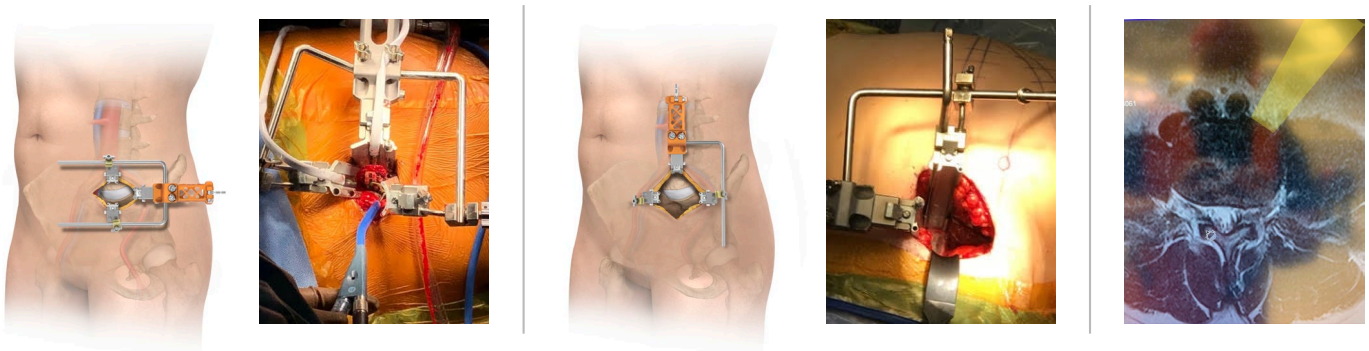
Typically, from approximately three finger breadths anterior the anterior superior iliac spine (ASIS) the incision is begun. If doing an isolated L5-S1 disc level, one may choose to make the incision perpendicular to the disc space in a medial direction along the disc space line. If more proximal levels are to be addressed, via this approach then a more diagonally based incision may be preferable. As the incision is carried through the skin and subcutaneous tissue, one then encounters the external enveloping fascia at the juncture of the external oblique and rectus musculature. This is easily noted anatomically with the obvious directional change of the fibers of these muscles. Ideally it is at this juncture where the continuation of the dissection ensues. A small nic is made through these fascial layers and one should then be able to visualize peritoneal tissue. Once an opening in the abdominal wall has been achieved to this point, placing a finger underneath the wall but anterior to the peritoneum will allow a safe plane of more existential exposure. Having achieved an adequate opening, it is then necessary to begin mobilization of the peritoneum to access the retroperitoneal space. It is best to start off typically with two fingers sweeping the peritoneum for the lateral and anterior wall via blunt dissection. At this juncture, depending on the amount of retroperitoneal fat, one may be able to then visualize the vasculature but certainly gentle palpation allows you to begin identifying the iliac vasculature. Palpation medial to the pulsation will typically aid in identifying the sacral promontory. At this point gentle blunt



dissection should allow mobilization of the vasculature ipsilaterally as well as identifying the crotch of the bifurcation. Once anterior annulus is identified by its characteristic appearance placing blunt retractors with protective lips underneath the vasculature one should be able to begin mobilizing the vasculature. Blunt mobilization with an endoscopic kittner will help to move the lumbosacral plexus as well as the sympathetic chain away from the operative field. At this juncture, the ATLAS System from Pantheon allows retraction per surgeon choice. Some surgeons prefer initial mobilization of the iliac artery, vein and associated neural structures with the primary blade while other surgeons prefer to retract superiorly or towards the crotch of the bifurcation with the primary blade. In either option, identification of the common iliac or middle sacral artery is critical. If ligating this structure is to be done it is probably best to do that at this juncture to facilitate further mobilization.

Retractor Fixation Options

If the surgeon chooses to use the primary blade for ipsilateral mobilization and retraction of the iliac vasculature the retraction is then carried out and given the styling of the blades a pin is placed into the vertebral body under direct visualization. A secondary blade is then placed into the bifurcation with proximal retraction being carried out. This is also secured with a pin under direct visualization. Final connection of blades to the retractor body and subsequent table arm are then secured. A tertiary blade can then be placed to be able to maintain the desired aperture throughout the case. Optionally a fourth blade can be applied that in essence creates a box through which to carry out the remainder of the operation. If the primary blade placement is chosen to be more towards the bifurcation the retractor design allows for the creation of the same montage.



Disc Space Preparation

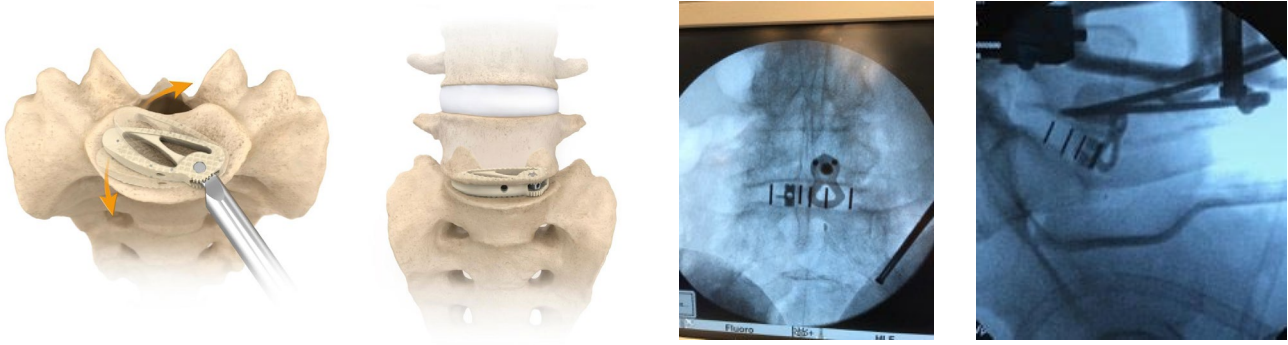
Standard disc space preparation is carried out to include annulotomy, discectomy, various instrumentation to achieve distraction, implant trialling, selection of interbody cage based on height, width and lordosis desired.

Trial Insertion

It is significant to point out that the unique design of the pantheon cage allows for a minimized annulotomy if preference is to maintain as much of the anterior longitudinal ligament (ALL) stabilization as it is standardly desirable in a lateral approach or has the option of being inserted much like an antero-lateral interbody fusion (ALIF) interbody implant.

Cage Implantation

The centralized oblique I-Beam allows for copious graft placement while maintaining maximum structural integrity of the cage itself. Strategic tantalum pin placement allows for fluoroscopic confirmation of placement in both AP and lateral planes.



Additional Anterior Plate Fixation

If the surgeon so chooses a buttress plate would then be applied.

Closure

At this juncture step wise disassembly of the retractor is carried out under direct visualization to ensure no significant bleeding has occurred. It may be desirable to backfill with bone wax or injectable hemostatic material if this is the custom of the surgeon. Layered closure is then carried out.

Cleaning

Point of Use

After use, all surgical instrumentation should be disassembled and wiped clean of visible soil using a disposable cloth or paper wipes and tap water. Reference instructions for use or contact a Pantheon representative if unsure how to do so. Extra care and detail should be focused on moving parts, crevices, lumens, and areas where debris may be harbored. If on visual inspection instruments show any sign of wear, contact a Pantheon Representative for further maintenance.

Soak

Pantheon recommends manual and automated cleaning twice after pre-soaking instruments using an enzymatic cleaning solution such as MetriZyme mixed to manufacturer specifications. Each instrument should soak for a minimum of 50 seconds. Each assembled device should be completely disassembled prior to soaking. If the device is not intended to be disassembled then the instrument should be run through the full intended range of motion while fully submerged. A cleaning brush and/or lumen brush should be run over every surface with attention to detail over crevices and hard to reach area such as lumens. After the second soak, each instrument should be rinsed for 30 seconds with RO/DI water.

Automated Cleaning

All surgical instruments should be cleaned in a medical grade ultrasonic cleaner compatible with stainless steel, plastic and soft metals. Cleaner should be able to maintain 140 degrees Fahrenheit (60 degrees Celsius) of a low foaming, neutral PH, phosphate free cleaning solution. Do not use bleach or formalin solutions. Allow instruments to sonicate for 10 minutes. Rinse each instrument thoroughly with TO/DI water for 2 minutes. Transfer instruments into washer for sterile processing. Run all instrument through a complete cycle using manufacturer recommended solution and temperature. After cleaning and drying (15 minutes) the instruments should be removed and sterile packaged as per hospital protocol. Instruments should be stored in a dry, dust free area without temperature extremes.

Warnings/Contraindications

- Read and follow all product information and indications for use prior to using
- Use of this system is contraindicated when there is active systemic infection and/or infection localized to the site, or when the patient has demonstrated allergy or foreign body sensitivity to any of the instrument materials
- Conditions that may place excessive stresses on bone such as severe obesity or degenerative diseases, are relative contraindications. The decision whether to use these devices in such conditions must be made by the physician taking into account the risks versus the benefits to the patient.
- Components of this system should not be used with components of any other system
- Instruments may break or slip if misused or mishandled.
- Improper maintenance or inadequate sterilization may cause harm to patient or staff.
- Risks of injury to patient or staff due to extreme forces from procedure. If a broken, bent or damaged instrument is used, it may cause harm to the patient or staff.
- Broken fragments or damaged instruments should not remain in the body due to risk of allergic reaction or infection.
- Caution should always be used when operating near organs, nerves, vessels and other important structures. Limit forces applied when adjusting or manipulating the retractor to avoid harm to patient and staff.
- Each instrument should be visually examined before entering the surgical field to ensure the device is in good working order. If there is any doubt about the working order of the device, it should not be used.
- Examine each instrument for burrs and/or sharp edges. Sharp edges may cause injury.
- Never expose instruments to temperatures in excess of 135 degrees Celsius or extreme cold
- Prior to retraction, ensure each retractor blade is properly seated and attached to the device. Avoid pushing on locking mechanisms while retracting to prevent accidental dislodgment.
- All points of attachment including retractor blades and body should be tightened and rechecked to ensure the attachment will not dislodge.
- Backup anterior instruments and an open abdominal retraction system should be available in case of an adverse event.

- Instruments should be stored in surgical trays after being cleaned from each use. Instruments should be stored in trays in a dry environment.
- Sufficient experience and knowledge with the procedure and the instruments is necessary to insure patient/staff safety, as well as satisfactory outcome.
- Proper patient selection and compliance is important for satisfactory patient outcome
- Extra precautions should be made for pediatric use.
- Light wires and tube should be inspected prior to introduction into the surgical field to insure no damage or wear is present.
- Blade fixation pins should be matched to the length of the blade length. Longer pins may lead to injury of the patient.
- Optimal outcomes of surgical procedures can be affected by factors of surgeon experience, training and patient conditions.
- Adequately instruct the patient. Postoperative care and the patient's ability and willingness to follow instructions are among the most important aspects of successful healing. The patient should be encouraged to ambulate to tolerance as soon as possible after surgery, and instructed to limit and restrict lifting and twisting motions and any type of sports participation until the healing is complete.