


# symgery

## T SYM™ Software Guide



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# 1. Introduction

## 1.1. About this Document

This document contains all the information required for any T SYM™ user to learn how to navigate through its software interface. It provides step-by-step instructions on how to use Symgery's T SYM™ simulator to its fullest potential and for its intended purpose. To install the T SYM™, refer to the **Installation Guide** also provided.

## 1.2. Scope and Audience

It is imperative that all future users read this document prior to using the T SYM™ in order to get a clear understanding of all the great features and functionalities that these simulators offer as well as the guidelines they must respect when operating such high-end machinery.

## 1.3. Warning: Read Before Operating

The Software User Guide is intended as a complete guide on the use of the T SYM™'s software. It must be carefully read and understood by all individuals who have or will have the responsibility of using this product. The product will perform as designed only if it is used in accordance with the manufacturer's instructions.

Any misuse of the T SYM™ simulator could result in a breach of the warranty. The directives and instructions described in this document must be respected at all times. In the event where the latter is not respected, the warranty is void. For any unclear matter, please contact the distributor or manufacturer of the system.

## 1.4. Related Publications

This document is part of a suite of documents available for Symgery's T SYM™ simulator:

### **Installation Guide**

Document intended for the users or for Symgery's distributors to correctly install the T SYM™ simulator. This document provides step-by-step instructions on how to unpack/pack the simulator, install it and move it from one location to another.

### **T SYM™ Technical Specifications**

Document intended for the users of the T SYM™ simulator. This document provides an accurate list of the different procedures available and a presentation of the features, surgical tools and physical specifications.

## 1.5. Product Description

The T SYM™ is a high-fidelity simulator designed for the training of medical students, orthopedic and neurosurgery residents to practice necessary skills required to master surgical procedures. It provides the user with a complete surgical experience with real force feedback, thanks to its haptic tools.

The T SYM™'s software comes with pre-programmed surgical tools, simulations, and features allowing the user to practice surgical skills. It provides a complete experience to the user by sending real time realistic feedback (visual, tactile, and auditory). The T SYM™'s software also provides preoperative files, surgical step instructions, real-time imaging, and simulation metric evaluations, which enable users to follow their progress and set targets for improvement. The simulator is updated with different surgeries and additional features on a regular basis, see example presented in Figure 1.

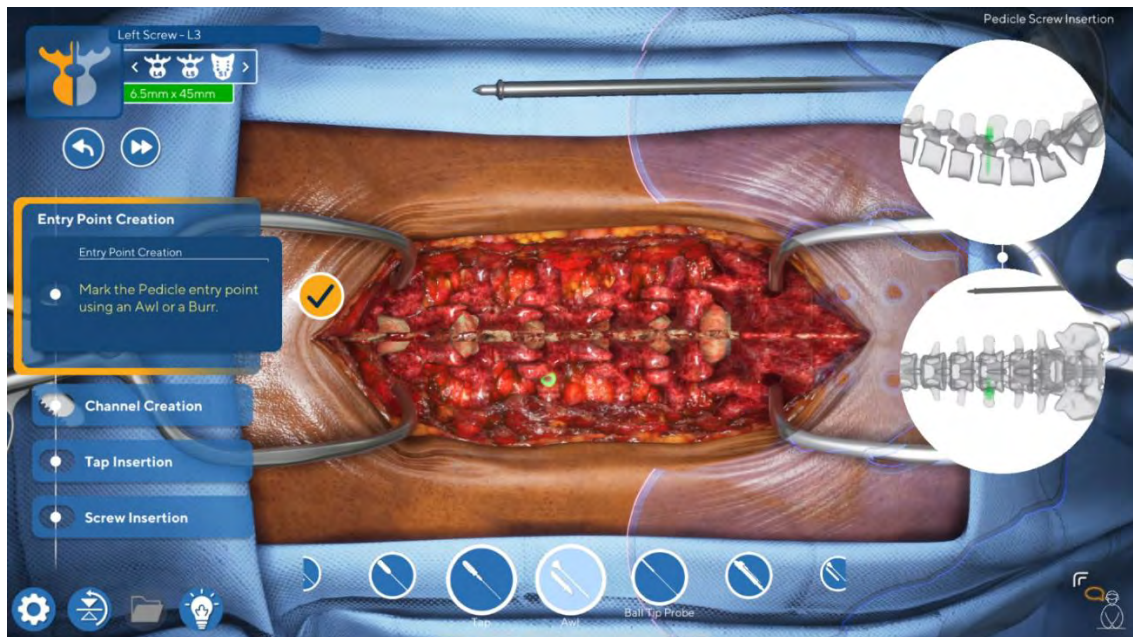


Figure 1 - Screen simulation example with Pedicle Screw Insertion Technique.



## 1.6. Software Launching

The T SYM™'s software will automatically launch when the simulator starts up and the computer is turned on. If the software does not launch itself, simply click on the T SYM™ software on the Desktop.

**⚠ Warning:** For optimal use, no other software programs should be opened while the simulator software is running.

## 1.7. End User License Agreement

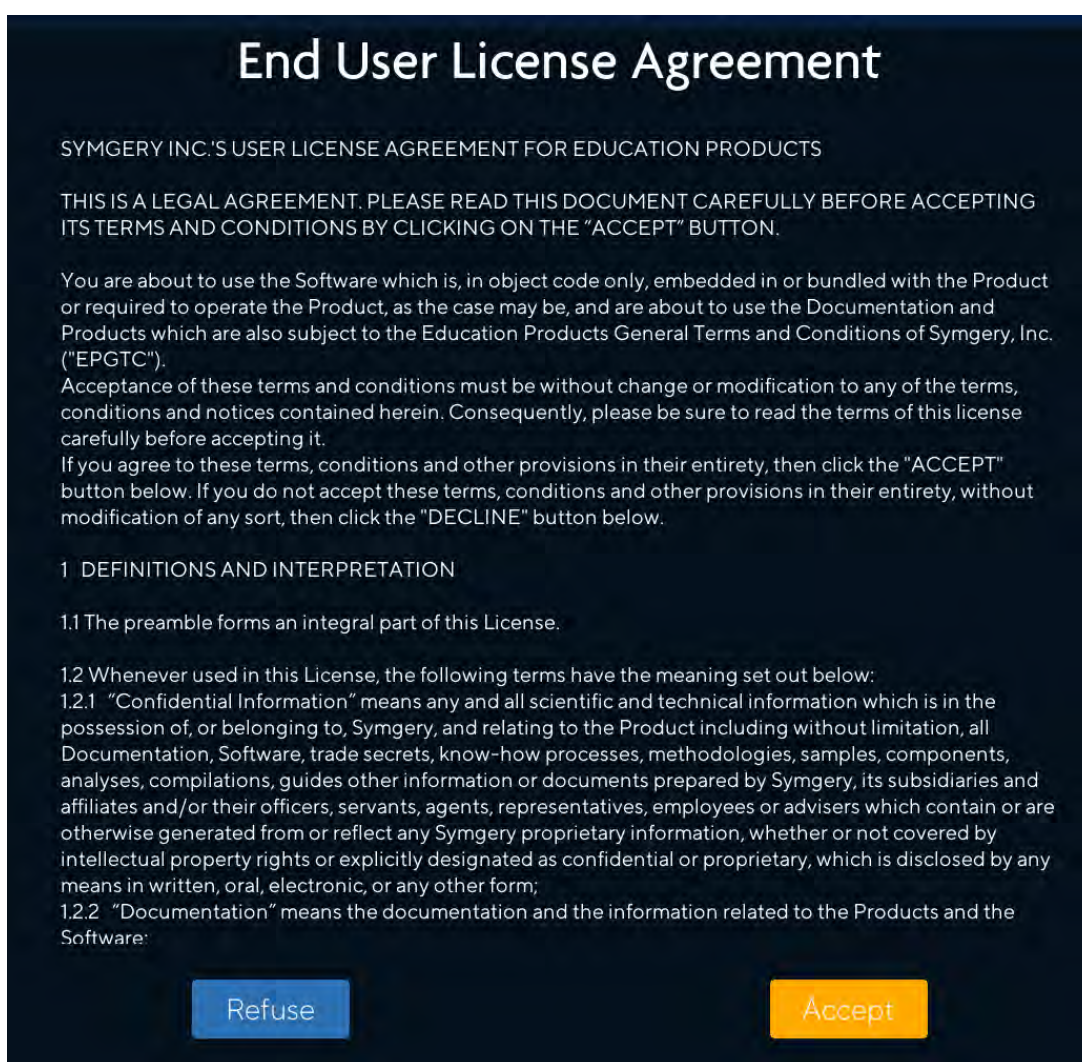


Figure 2 – Preview of the End User License Agreement.

Read the End User License Agreement and click on the yellow Accept button, see in Figure 2.

## 1.8. User account

Creating an account is the ideal way of using the T SYM™. You will be able to access all different simulation modes and track your progress this way. To create an account, login, or logout of the simulator, complete the following as shown in Figure 3:

1

### Account Creation

From the landing page, click on **Create account**.  
Enter the required information such as the username to use on the simulator, an e-mail address, and a password; re-enter the password to confirm it.

On the following page, you will be prompted to answer two security questions. Select the questions, input an answer and once all the information is filled in, click on continue.

2

### Account Login

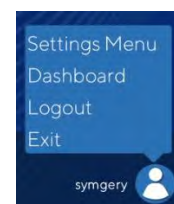
To log in to your account, enter the username and password you created in the account creation step on the respective fields in the landing page.

Figure 3 – Account Login panel of the landing page.

### Account Logout and Exit

To log out from your account, click on the user profile at the bottom right of the page and press on the Logout button.

To close the software, follow the same instructions and click on the Exit button.



## 2. T SYM™ Landing Page

You are now at the main menu of the T SYM™. You have the option of choosing between the two different modules: Dry Lab and Spine, see Figure 4.

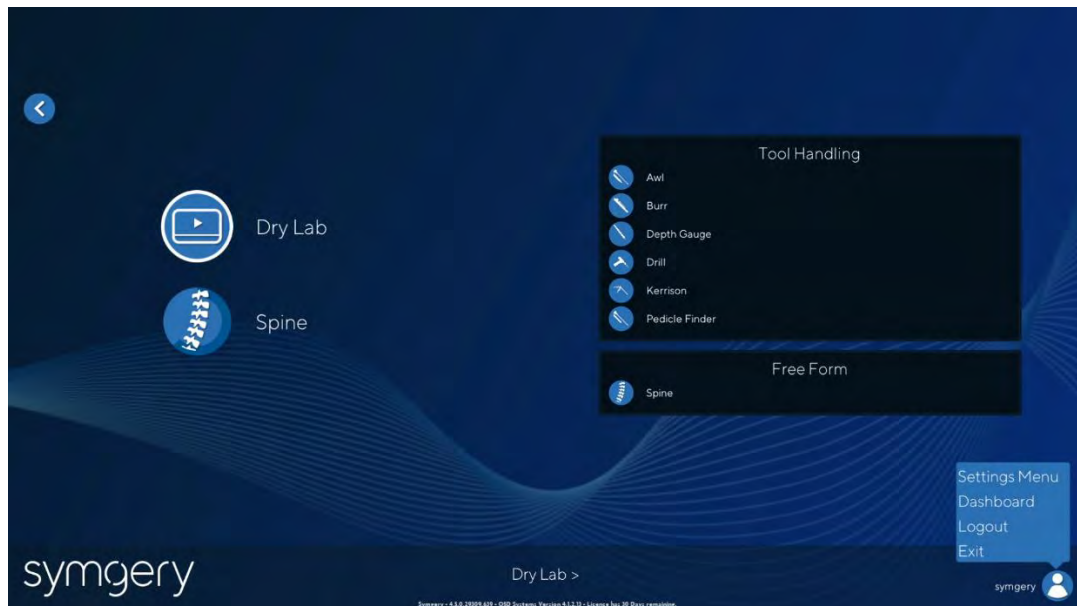


Figure 4 - Main Menu page with Dry Lab mode.

### Dry Lab

The Dry Lab module allows you to practice individual instruments in a lab setting and practice inserting screws on a free-form spine. This is an excellent place to start to learn how to change the tool handles, begin your in-simulation depth perception, and experience haptics for the first time.

### Spine

The Spine module allows you to practice surgical steps in an immersive environment such as a bony decompression, disc fragmentectomy, pedicle screw insertion, and more. There is the possibility of doing full patient cases which include a complete *Preopfile* and details on the patient, as well as surgical techniques without the full patient case.

**We recommend that first time users start with the Dry Lab module first and go through all of them at least once to become familiar with the simulator and its abilities.**

## 2.1. Simulator Basics

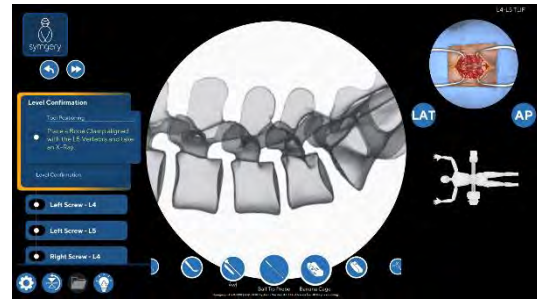
Before using the simulator, here are a few pointers to help you get started in a simulation (Dry Lab, Spine).

Two views are available in a simulation:



**OR view**

This view, also called Patient view, represents an intraoperative view of the surgical site. Please refer to next section to interact with this view.



**X-Ray View**

This view represents a fluoroscopic view of the surgical site. Please refer to section 3.5.4 to interact with this view.



## 2.1.1. Modifying the Camera

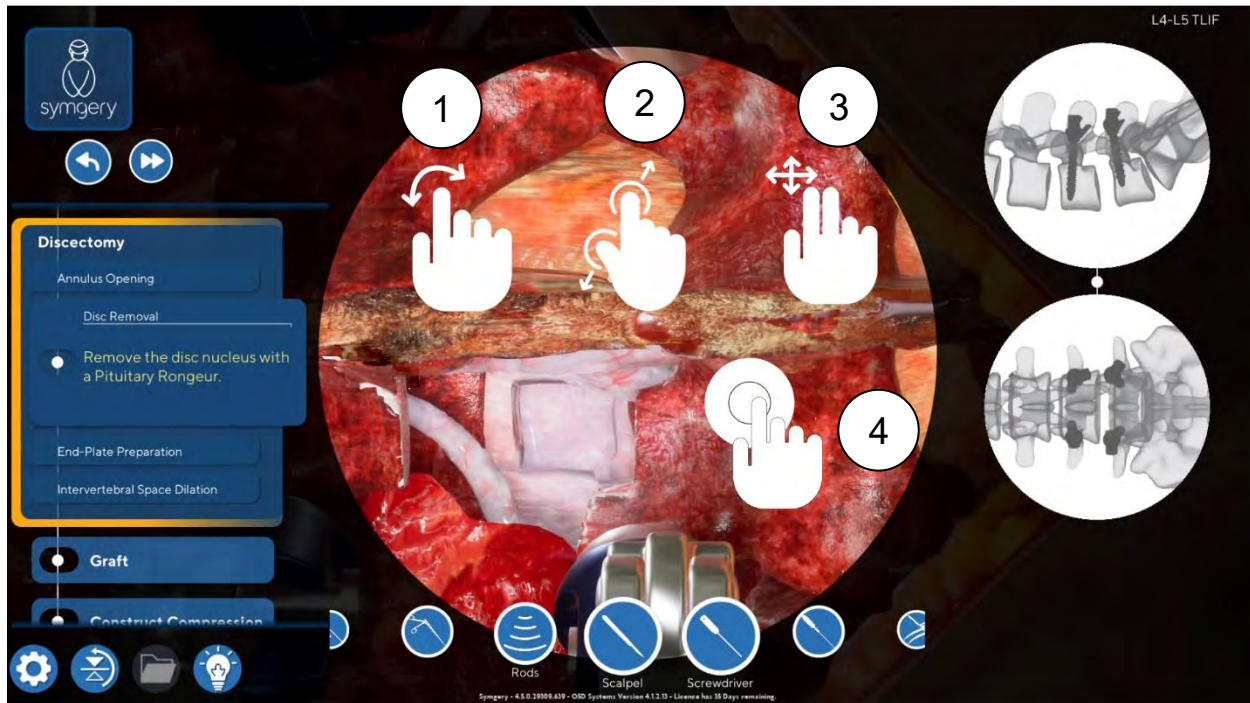


Figure 5 - Camera controls with touchscreen.

- 1 To **rotate** the patient view: Use one finger and slide it around, this will rotate the patient view back and forth and allow you to observe the surgical site in 3D.
- 2 To **zoom** in and out of the patient view: Pinch your fingers in and out.
- 3 To **translate/slide** and move across the patient: Use 2 fingers to move up and down or left and right.
- 4 To **recenter or reset** the camera: Double tap near the center of the screen.

## 2.1.2. Settings



To access and change the settings, click on the Settings button at the bottom left of the screen in simulation mode.

From the Settings menu, you can configure **Audio**, **Controls** (see Figure 6) and **Assists** settings. You can also restart or exit a simulation (in simulation mode). You must click on the yellow **Apply new settings** button to save the settings otherwise they will not be saved or applied.

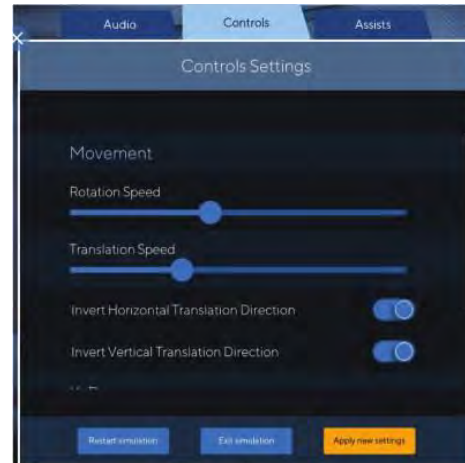


Figure 6 - Controls Tab preview from the Settings Panel.

### Audio Settings

**Master Volume** – controls the overall volume.

**Tools Volume** – controls the tools' volume.

**Ambient Volume** – controls the ambient volume made by the cardiac and respiratory rhythm control machines.

**Special Effects Volume** – controls the interface volume.

### Controls Settings

**Rotation Speed** – controls how fast the camera is rotating when sliding with your finger in the surgery view.

**Translation Speed** – controls how fast the camera moves when sliding with two fingers.

**Invert Horizontal Translation Direction** – inverts the direction of the horizontal sliding (left to right becomes right to left).

**Invert Vertical Translation Direction** – inverts the direction of the vertical sliding (top to bottom becomes bottom to top).

**X-Ray: Real Time X-ray** – activates or deactivates real time fluoroscopy (if it is OFF, manual refresh of the X-ray is necessary).

**C-arm Rotation Speed** – controls how fast the C-arm is rotating when sliding with your finger on the X-ray.

### Assists

**Display Guidance** – displays or hides guidance on the surgical site and on the X-Ray.

**Automatic Show Me (Ghost Tools)** – automatic launch of a ghost tool at the beginning of each step showing how to perform said step.

**Calibration** – follow the instructions displayed on the screen to calibrate the Closing handle.

## 2.2. Tools

### 2.2.1. Selecting and Changing Tools

At each step within a Spine simulation or the Dry Lab, follow the guidelines at the left of the screen to know which tool(s) to use.

The three tool handles, Actuated Straight, Angled/Closing, and Pistol, can simulate more than twenty virtual surgical tools, some available in several sizes. **A pop-up will show up when you need to change the tool handle you are currently using.** Note that the Angled Closing and Straight Closing tool handles are the same, however, they use a different entry for the connector, as shown in Figure 7.

The Animated Tools are tools that do not require a tool handle – they are part of an animation once clicked in the Toolbar.

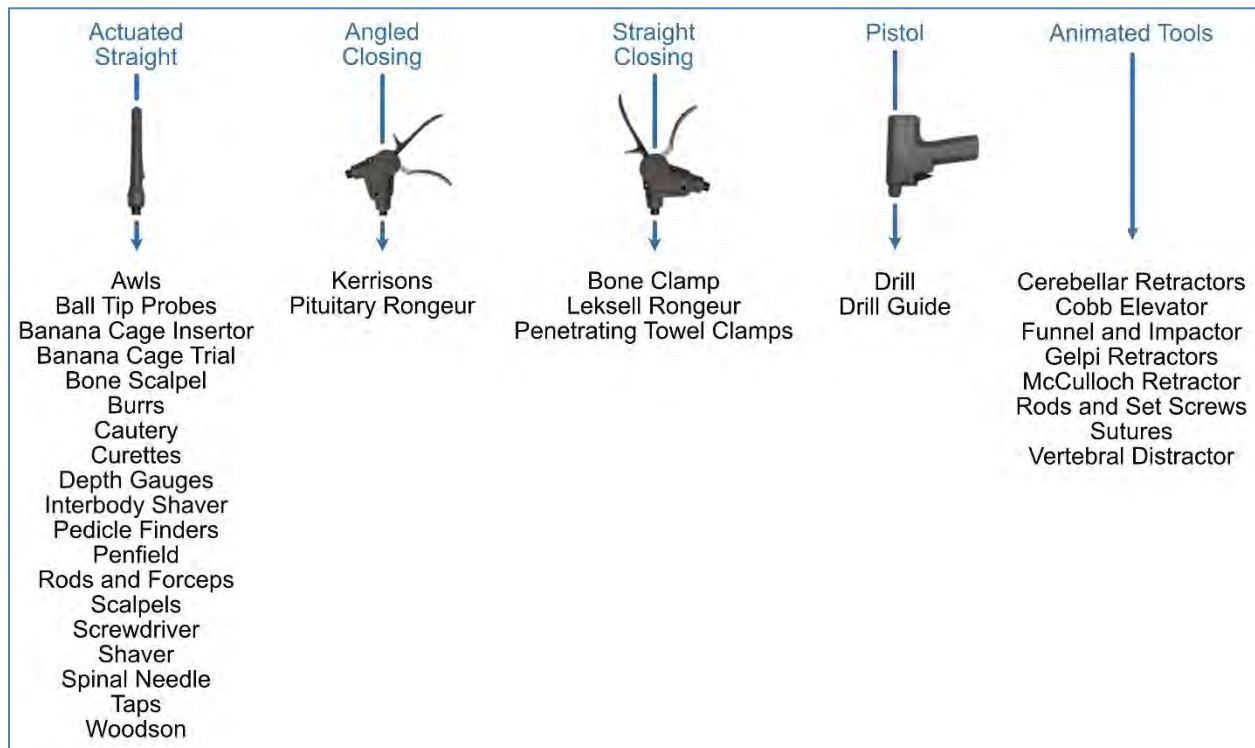


Figure 7 - List of the surgical tools available in the procedures.

Some surgical tools can be activated either manually (i.e. button on the Actuated Straight Handle and Pistol Handle or pressing clamps for the Closing Handle) or by pressing on the Left pedal in OR view. It is important to be in the OR view because pressing on Left pedal in the X-Ray view will instead take an X-Ray shot, see section 3.5.4.

Slide through the toolbar at the bottom of the screen to find the tool required, see Figure 8. This toolbar has the ability to scroll infinitely, therefore you can keep scrolling until you find the tool you want to use. The list of tools is in alphabetical order.



Figure 8 - Horizontally scroll the toolbar to select the desired surgical tool.

If the tool selected has several sizes, orange sub tools will appear on top of the tool button. Press one size to select it, and it will be displayed with a white outline, as shown in Figure 9.

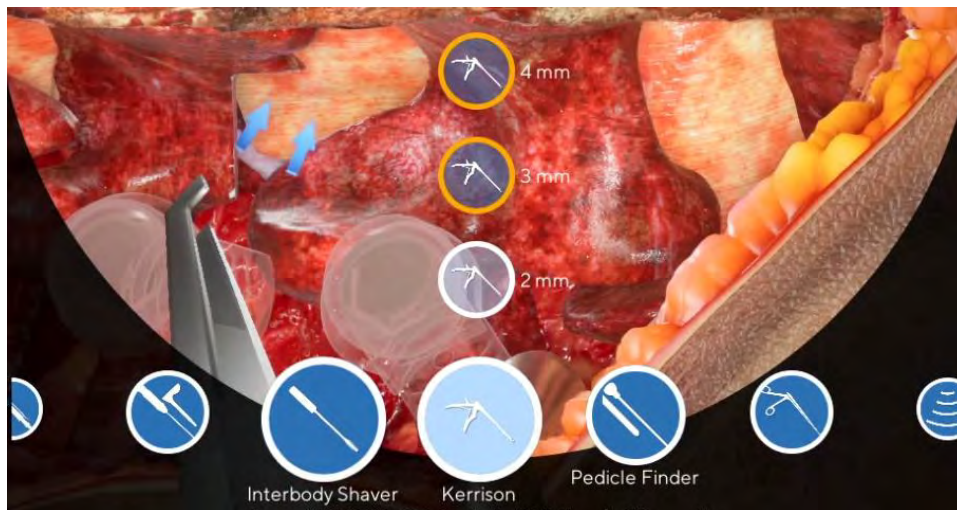


Figure 9 - Example of the Kerrison tool that has several sizes. Size 2mm has been selected.



## 2.2.2. Connecting a tool's handle to the haptic arm

Select the surgical instrument handle you wish to use from the tool holster beside the simulator. There are the following instrument handles provided:

- Actuated Straight
- Angled and Straight Closing
- Pistol

Notice the flat side of the connector on the tool handle. It is inserted by matching it with the flat side of the connector on the haptic arm, see Figure 10. Just align the two flat sides and push the handle connector into the haptic arm connector until you hear a click. Each tool is attached in the same way.

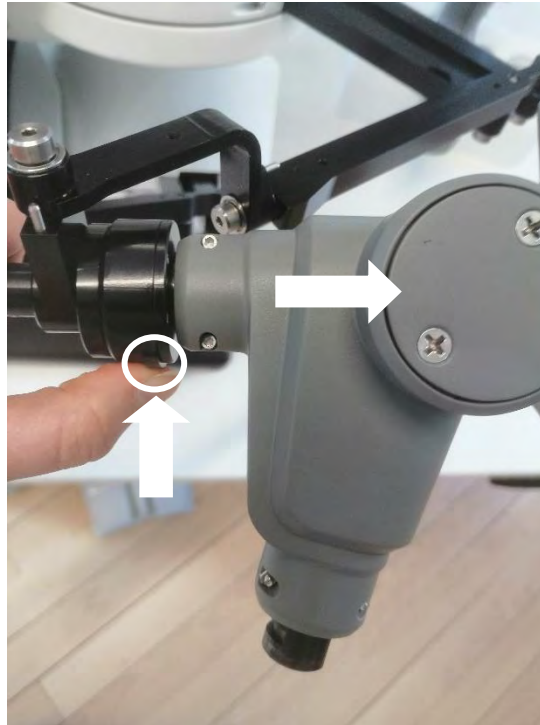


*Figure 10 – Example of the connectors on the Straight Closing tool. The two flat sides of the connectors are highlighted with two white lines on the picture. Plug the handle in the T SYM™ connector until you hear a click.*



### 2.2.3. Disconnecting a tool's handle from the haptic arm

To disconnect a tool's handle, push the button and pull the handle from the haptic arm's connector, as shown in Figure 11.



*Figure 11 – Example of disconnecting the Straight Closing tool. To disconnect, press on the Push button circled in white and pull the Straight Closing tool.*

Practice exchanging the tools several times until you feel comfortable and can do it with ease.

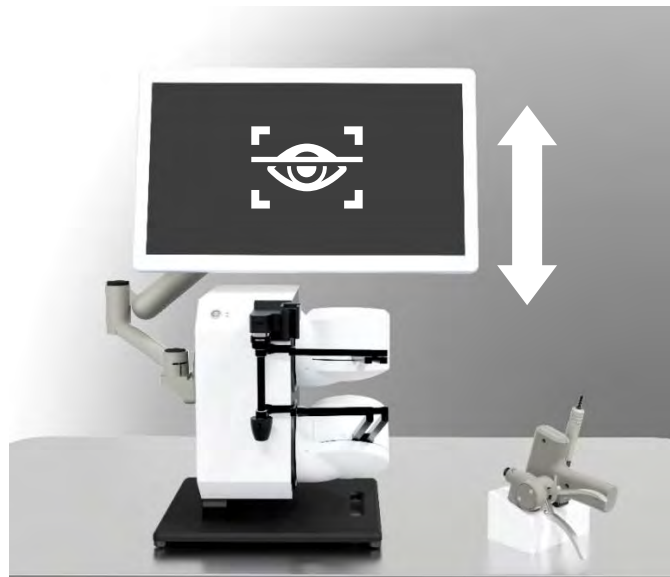
**You may have to move the tool's handle around in front of you to see your virtual tool appear on the screen.** Take a few seconds to move the tool around and get a feel for manipulating the tool in the 3D environment. Now, slowly descend the tip of the tool onto the surgical site. When the virtual tool makes contact, you will “feel” the body part. You are now experiencing haptics.

## 3. Launching a simulation

As mentioned earlier, there are two different modules to use: Dry Lab and Spine. This section of our software guide covers these modules in detail.

### 3.1. Before Use

At any moment, you can adjust the monitor of the T SYM™ to be aligned with your eyes as presented in Figure 12.



*Figure 12 – With your hands placed on each side, move up or down the monitor of the T SYM™.*

We advise you to place the T SYM™ on a moving table to adjust the height so as your arms are bent 90 degrees in a simulation, see Figure 13.



*Figure 13 - Move your table up and down to ensure your arms are bent 90 degrees in a simulation.*

## 3.2. Safety

For a safe use of the T SYM™, we recommend employing the following:

### 3.2.1. User safety

- ⚠ Use a stable table to place the T SYM™ on. The table should be sturdy enough to support the weight of the simulator (75 lbs / 35 kg), please refer to the **Installation Guide** provided.
- ⚠ Do not place your face in the haptic arm's working space. The arm should be held with your hands by the tool handle or the robot link to which it is attached. Holding other parts of the robot could lead to pinching.
- ⚠ Deviating from the normal use as the simulator to train the provided surgical procedures could lead to unexpected haptic behaviours (for example, do not attempt to place screws in arbitrary locations on the patient). Instead, follow the timeline and instructions for each surgical step (see section 3.5).

### 3.2.2. Simulator safety

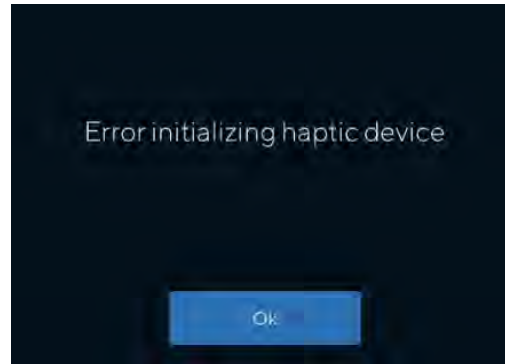
- ⚠ Be gentle with the T SYM™ and the haptic robotic arm. If too much force is applied on the haptic arm, it could lead to damage.
- ⚠ If your virtual tool seems stuck in the patient or unresponsive in the simulation, please disconnect and reconnect the haptic handle on the haptic robotic arm, refer to section 2.2.
- ⚠ The haptic arm should never be unsupported. At all times, it should be either at home position (see Figure 12), held in your hands (see Figure 13) or be in the resting position:





Do not let go of the robot when a virtual tool is in contact with the patient. This is because the robot can be damaged if it supports its weight plus that of the tool handle for an extended period of time. For example: starting a screw insertion and releasing your grip of the tool in the middle of the action.

### 3.2.3. Troubleshooting



If the above haptic error is displayed on the monitor of the T SYM™, please exit the simulation (refer to section 1.8). Make sure all electrical cables are connected as per the **Installation guide**. If this error message persists, contact Symgery.



If you notice the following warning in your simulation: “Your T SYM™ needs an update, please contact Symgery at [info@symgery.com](mailto:info@symgery.com)”, please contact Symgery at the email address provided.

For any other errors you may encounter with your T SYM™, please contact us at [info@symgery.com](mailto:info@symgery.com).

### 3.3. Dry Lab

As a first task, we recommend experimenting with the Dry Lab to become accustomed to using the tools and getting used to the haptics in the T SYM™. To get started, click on Dry Lab in the main menu and choose one of the following tools as shown in Figure 14:

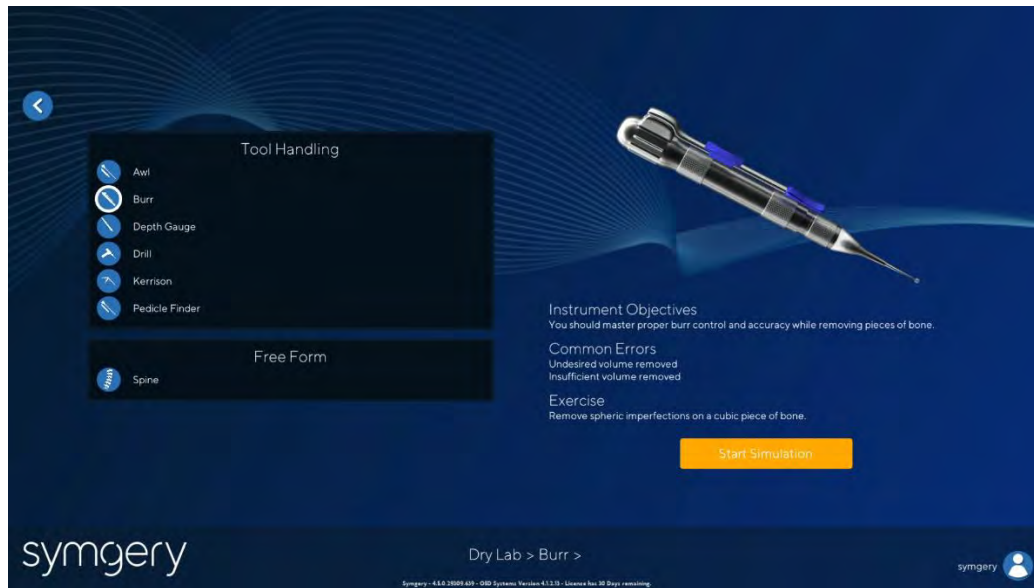


Figure 14 - Burr example preview from the Dry Lab mode.

Click on the yellow Start Simulation button once you've chosen a tool to experiment with.

Connect the handle as shown in the section 2.2.2 Connecting a tool's handle to the haptic arm.

Feel free to explore the haptics and depth perception. **Please note that you will not always receive feedback in the Dry Lab mode.**

When you complete the dry lab requirements, you need to click on the *Skip* button (see section 3.5.1), a pop-up window will appear to cancel and stay in the dry lab, restart from the beginning or exit to return to the previous menu, see Figure 15. You have the option of either selecting another tool, performing pedicle screws in our Free Form Spine with a T5-L1 scoliosis fixation, or starting a simulation by returning to the Main Menu.

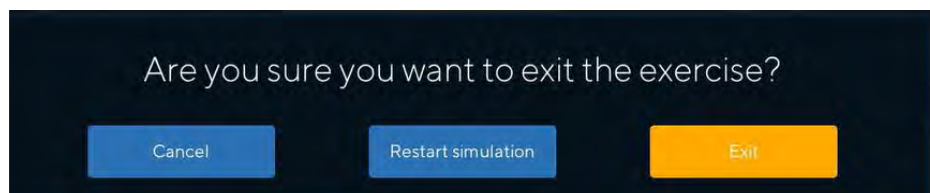


Figure 15 - Dry Lab pop-up after clicking on Skip button at the end of the exercise.



## 3.4. Spine

The next option at the main menu is to try the comprehensive simulations using the **Spine** module. The **Spine** module comes with different learning experiences to choose from: **Patient Cases**, and **Techniques**. Please refer to section 3 of the associated document **T SYM™ Technical Specifications** to have the detailed list of the procedures.

### Patient Cases

The patient cases are entire cases that include a *Preopfile* with details including the history, clinical assessment, diagnosis, and different medical images of the patient. In this type of simulation, you complete the simulation from start to finish. These are inspired from real patient cases and include imaging from real cases.

### Techniques

In this type of simulation, users are given an opportunity to practice different techniques that are important in spine surgeries. For all techniques, the surgical opening has already been done and there is no pathology or corresponding *Preopfile*. Users can experiment with these techniques, can practise on healthy anatomical structures (no pathology) and receive feedback on their efforts.

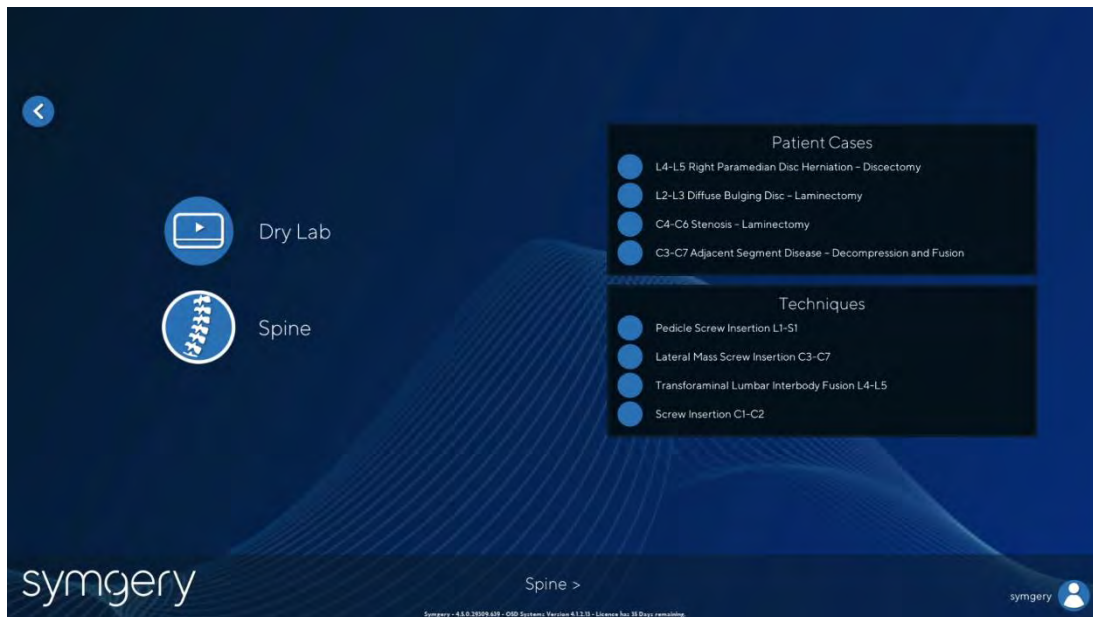


Figure 16 - Spine mode with the different learning experiences.

### 3.4.1. Patient Cases

The Patient Cases are entire cases that include a *Preofile* with details including the history, Indications and Contraindications, the OR setup, the Procedure Steps and how to navigate the Simulation interface. In this type of simulation, you complete the simulation from start to finish.

You can access the *Preofile* before starting a simulation, from the Navigation Menu:

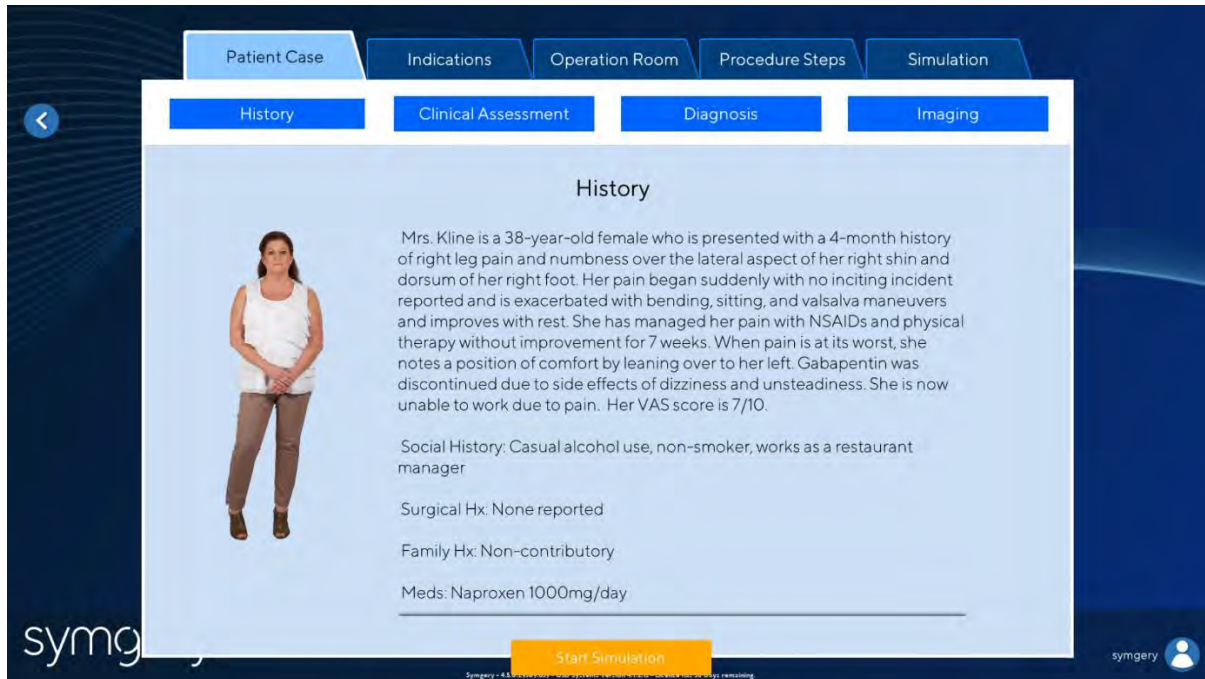


Figure 17 - Preofile example from L4-L5 Discectomy Patient Case.

When you are ready to begin, click on the yellow Start Simulation button.

You can also access the *Preofile* at any time during a simulation by simply clicking on the third button on the bottom-left corner, see Figure 18:



Figure 18 - Preofile icon at the bottom left of the screen.

### 3.4.2. Techniques

Another type of simulation available after the Patient Cases is the Techniques (see the example in Figure 19). This differs from the Patient Cases since it is not expected for users to perform a complete procedure (i.e. opening and closing the patient, reading up on the history of the patient, etc.). In this type of simulation, the purpose is to strictly practice the techniques available on a healthy spine.



Figure 19 - Screen simulation example with Pedicle Screw Insertion Technique.

As you go through the technique, you will see the patient on the operating table, as well as two different X-Ray modes that update in real time (unless you are in Evaluation mode), see Figure 20. Furthermore, the timeline on the left updates as you go through the steps.

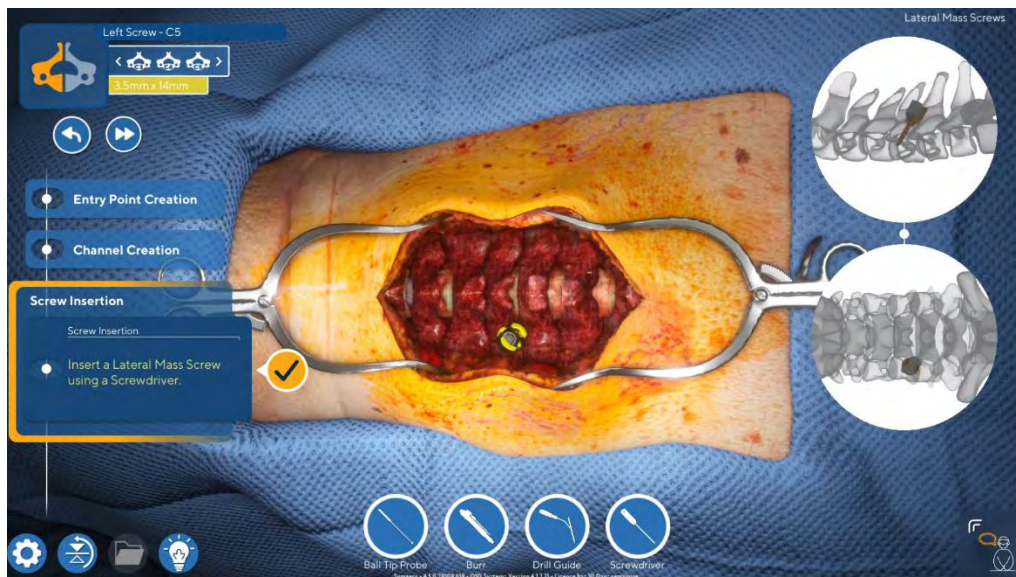


Figure 20 - Screen simulation example with Lateral Mass Screw Technique.



### 3.4.3. Learning, Practice and Evaluation modes

In both Patient Cases and Techniques simulations, you can complete the procedure with three different modes: Learning, Practice and Evaluation, as shown in Figure 21. **The selected mode will be highlighted in a lighter blue:**



Figure 21 - Preview of the available modes.

**We advise to start with the Learning mode, then to move on with the Practice mode and finally with the Evaluation mode.**

#### Learning mode

Learning mode is suggested as the first mode to use when starting with the simulator or as a refresher for the surgeries. The goal of the learning mode is to be a first entry for users to the simulator and the chosen surgeries. It gives a tutorial for the surgery, and will provide instructions for each step, a ghost mode that is automatically triggered to visualize the steps, guidance within the simulator to explain what needs to be done, feedback given after each step, and access to the learning tab that gives operating room tips, videos and images to further explain the steps done in the surgeries.

In the learning mode, users have an infinite number of chances to repeat steps and skip them if they choose to do so. They are penalized less harshly than in different modes.

#### Practice mode

Practice mode, the mode after Learning, should be attempted after completing the learning mode of the simulations. Similar to the Learning Mode, instructions are displayed for each step, feedback is given, and users have access to the *Preopfile*. However, the ghost tool and learning tab are only available on demand; users can select these options in the Setting Assists panel, see section 2.1.2. Real Time X-ray is still ON in Practice mode.

#### Evaluation mode

The final mode is evaluation, a complete assessment mode that should be attempted only after going through the Learning and Practice modes of the simulations. In this mode, the user is on their own with the patient; the step progression is displayed, but the ghost tool, guidance and learning tab are no longer available. Real Time X-ray is set to OFF and cannot be changed in the Controls Settings Tab.

**Evaluation mode is only available if you are logged into an account on the simulator. It is recommended that you are always logged in to your account to be able to track your progress throughout the use of the simulator.**

## 3.5. Performing a Step

When a simulation has begun, there will be instructions given on the left side of the screen in the Steps Timeline.

**⚠ Deviating from the normal use as the simulator to train the provided surgical procedures could lead to unexpected haptic behaviours (for example, do not attempt to place screws in arbitrary locations on the patient). Instead, follow the timeline and instructions for each surgical step.**

**Anatomical structures mentioned in the instructions (i.e. ligaments, intervertebral disc, bones) are destructible structures, meaning an action can be made on them. All other structures (i.e. skin, interstitial tissues, nerves, etc) are for visualisation purposes.**

Refer to the following Figure 22 and numbers for a thorough explanation of what you may see on the screen.

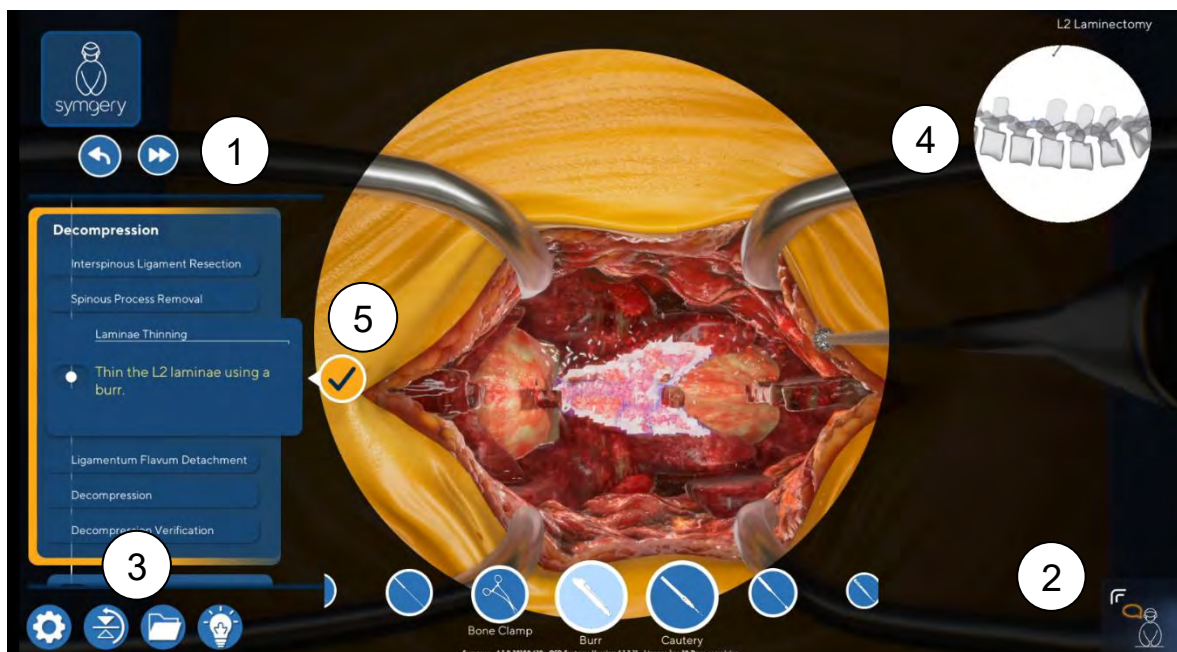


Figure 22 - Simulation screen example with L2-L3 Laminectomy Patient Case.

- 1 The *Steps Timeline* guides you through the simulation. To manually undo or skip a step, click on the *Undo* or *Skip* buttons. The Instructions are also found in this timeline, which give you details on what to do and what tools to use. In Evaluation mode, only the title of the step is provided. Refer to next section 3.5.1 for more details on the timeline.
- 2 The *Learning Tab* gives you complementary OR Tips at each step. It provides you with additional content including illustrations, real-life surgical videos, and other tips. If you see the bubble next to the icon highlighted in yellow, this is indicating that the step has an OR Tip for the user, click on the learning tab to expand it.



- 3 The icons at the bottom left of the screen are as followed from left to right: Settings, Switching sides of the operating table (helpful for left-handed users), Access to the *Preopfile*, and a final Lightbulb icon which gives you access to the Ghost mode. This will launch a ghost tool showing you the action to perform at this step.
- 4 Clicking on the X-ray will bring you to the imaging system. Refer to section 3.5.4 to get a thorough explanation of what is provided in this system.
- 5 In certain steps, after you've selected your tool and performed your step, a *Confirm* button will appear to confirm your action. It is important to use this button when it appears, as this is what ensures that the simulation evaluates your performance at the correct point in time at each step, see section 3.5.2.

### 3.5.1. Steps Timeline and Zones

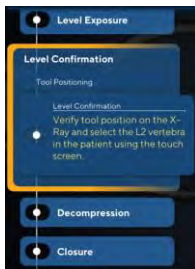
The Steps Timeline includes the following elements:



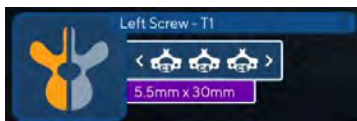
After confirming a step, the *Undo* button gives you the possibility to undo this last step to retry it.



The *Skip* button can directly skip a step you don't wish to perform. The *Skip* button will be disabled, however, while feedback banners are on screen. A skipped step will have the score "Not attempted" in the Results Screen.



The group step in progress ("Level Confirmation" in the example) has an orange outline to remind you of the current step you are working on. The instruction is also in a different color. You can scroll up and down the timeline to see previous and next group step. After 3s, the timeline will automatically come back to the current step you are on.



On the top left, the *Zone widget* can provide you with some information, when applicable, such as the name of the working vertebra, dimensions of the screw to be inserted in it, list of the other vertebrae in the procedure, etc.

**In the procedures with screw insertion, there is the possibility to perform the steps on multiple vertebrae in parallel. You can change zones by touching them with the haptic tool.**

For example, Pedicle Screw Insertion technique starts with Left L1 as the first working vertebra, see Figure 23. Touching the Left L3 vertebra with the haptic tool will automatically update the *Zone Widget* and the timeline, see Figure 24:

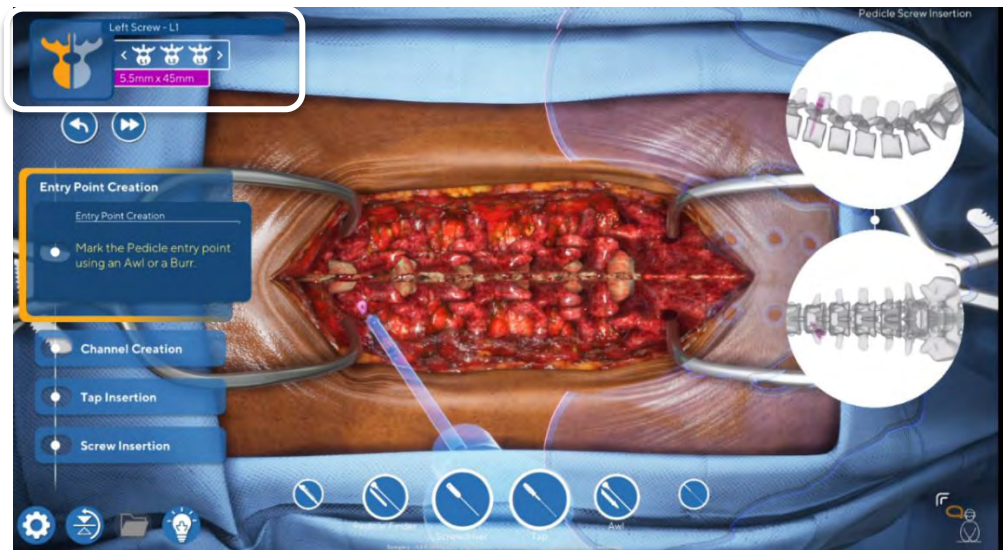


Figure 23 - Pedicle Screw Insertion technique starting with Left L1 vertebra.

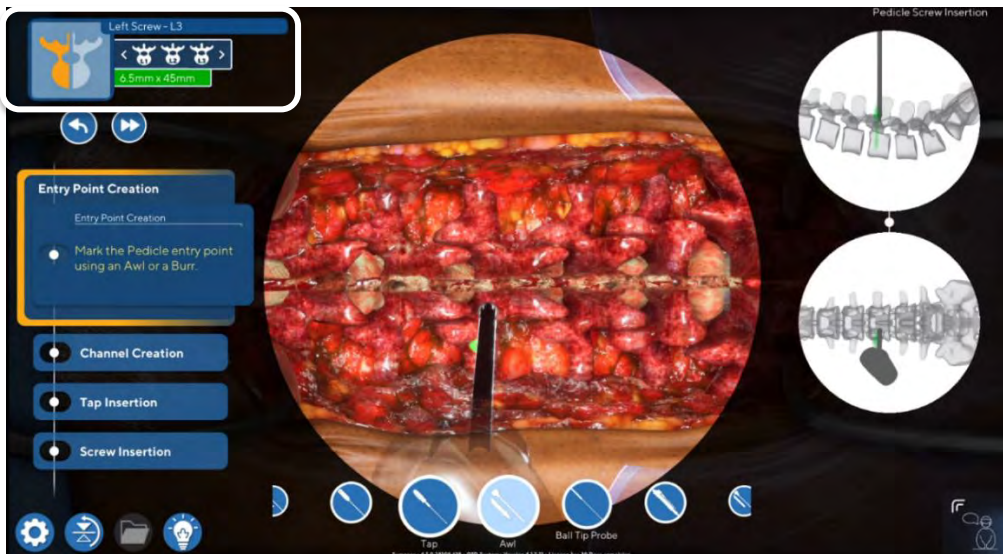


Figure 24 - Changing to Left L3 vertebra with the haptic tool. The Zone Widget has a flash when changing.

Changing to another vertebra without confirming the last action done triggers a warning pop-up. You will not lose the action, but you will need to confirm it next time you come back to this vertebra:

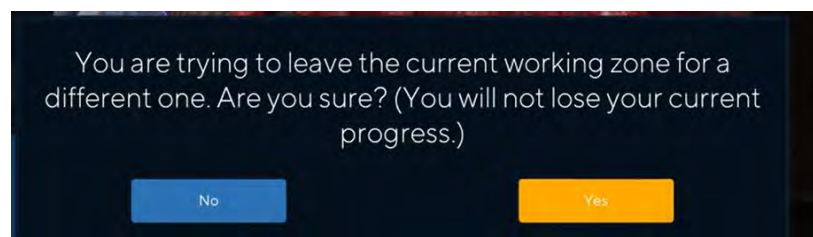


Figure 25 - Warning pop-up when changing vertebra zone without confirming first the last action done.

### 3.5.2. Confirm and Banners



The *Confirm* button appears after doing an action. You need to click on the button to be evaluated for the step.

There are also different types of banners that will pop-up throughout the simulations if you are in Learning or Practice modes.

Figure 26 shows an example of a **feedback banner**. After performing and confirming a step, depending on different variables, a sliding banner will appear indicating how you've performed this step and what you should pay attention to the next time. These come in green, as shown below, indicating an excellent performance; in yellow, indicating an acceptable but not excellent performance, and red, indicating an unacceptable performance.



Figure 26 - Excellent Feedback tip example (banner in green) with L2-L3 Laminectomy Patient Case.

There is also visual feedback, as shown in Figure 26, that appears after certain steps within the simulation. In this specific example, during the L2-L3 Laminectomy, while removing the interspinous ligaments, the green mesh seen in the image shows what should have been removed, and the red mesh shows what should not have been removed in this step.

Figure 27 shows another example of visual feedback. In this step of creating the screw entry point during the technique of the Transforaminal Lumbar Interbody Fusion (TLIF), the green indicates the perfect screw entry point, the yellow indicates an acceptable but not excellent screw entry point, and the red indicates a completely unacceptable screw entry point.



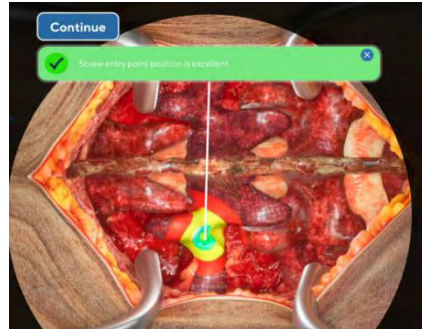


Figure 27 - Visual Feedback example (green, yellow and red colors) with TLIF technique.

All along the procedure, you will receive other “info” or “tip” banners in Learning and Practices modes to help you to correctly perform the steps, as presented in Figure 28 and Figure 29. Touching or damaging critical tissues will also trigger a visual warning as presented in Figure 30.

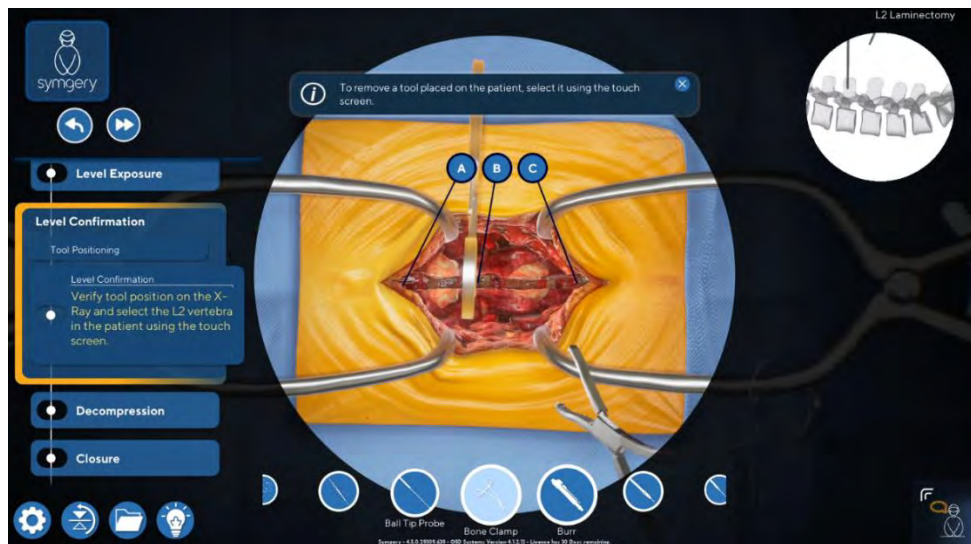


Figure 28 - Example of an "Info" banner to remove a tool placed in the patient in L2-L3 Laminectomy.

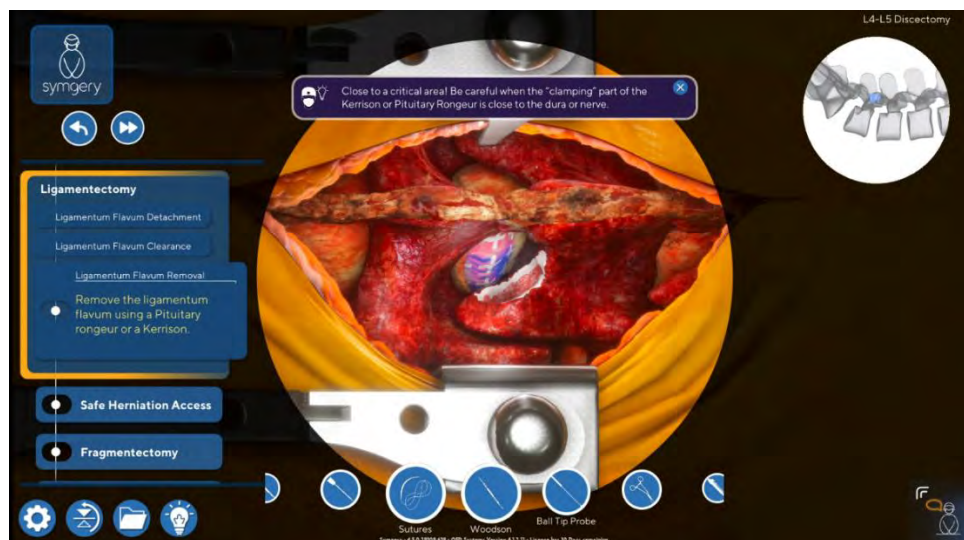


Figure 29 - Example of a "Tip" banner to correctly use clamping tools, close to a critical area in L4-L5 Discectomy.



Figure 30 - Example of a "Critical tissue" warning in C1-C2.

After the confirmation and evaluation, there is the possibility to close each banner one after the other by touching it or to close all of them at once by clicking on the *Continue* button. You will be automatically moved to the next step once all banners have been closed.

**⚠ Make sure you confirm each step and close all banners or click on *Continue* button to be evaluated on the step and to be able to go to the next one.**

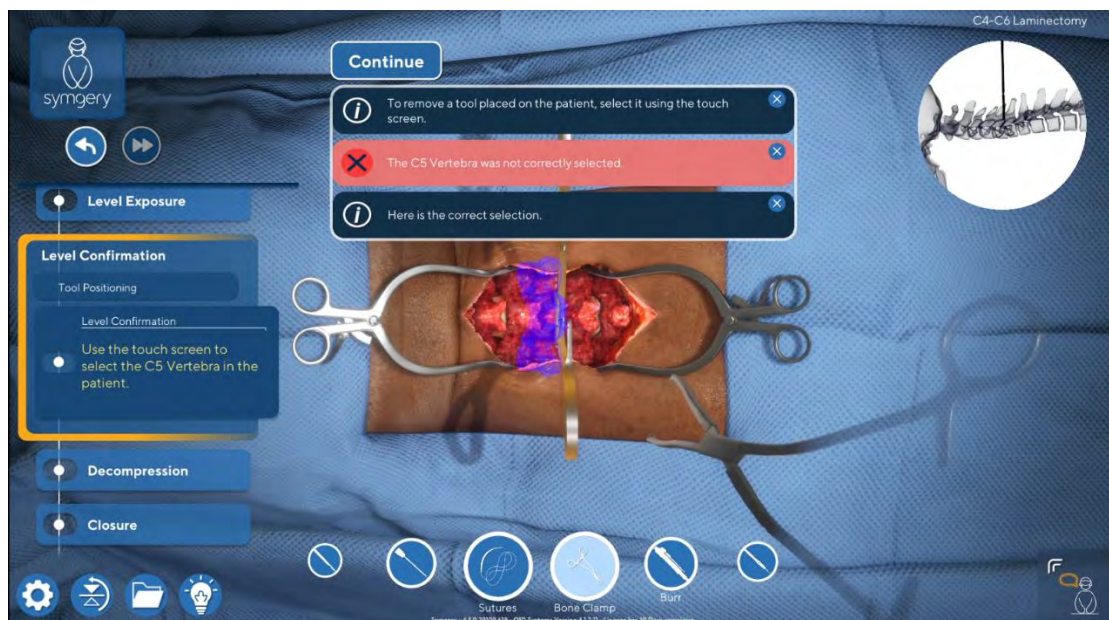


Figure 31 - Example of multiple banners and "Continue" button after confirming the step in C4-C6 Laminectomy.



### 3.5.3. Guidance and "Show Me" Mode (Ghosts Tools)

Throughout the simulations in Learning mode, and optionally in Practice mode, you will have access to helpful guidance that will assist you if you are stuck in certain steps. These will look differently depending on what the step is asking.

The Show Me mode appears automatically and can be triggered when you click on the lightbulb at the bottom left, see the white arrow in Figure 32. This will launch the ghost tool that shows you how to perform the step if you are stuck:

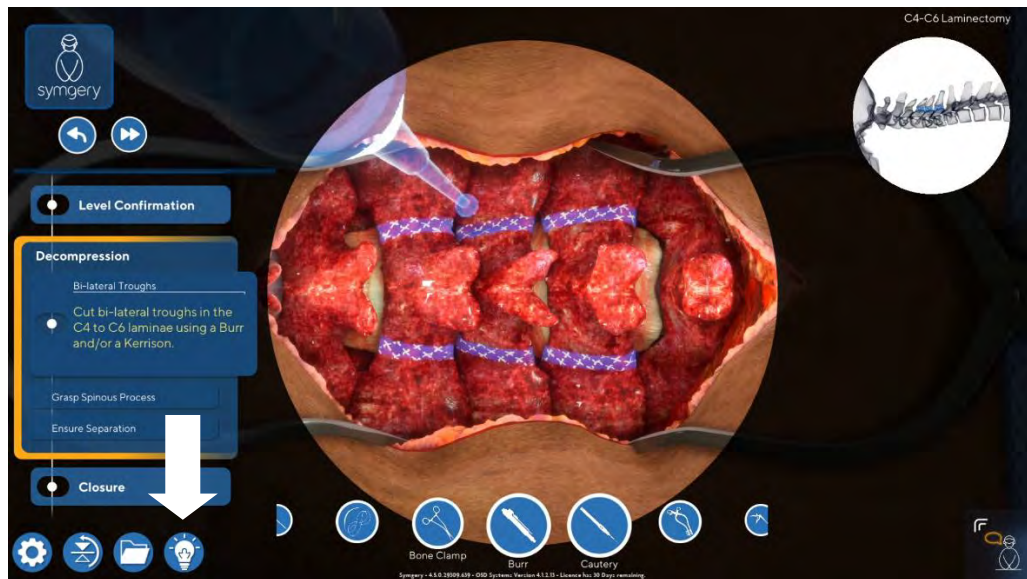


Figure 32 - Example of a Burr ghost tool in C4-C6 Laminectomy Patient Case. Press the lightbulb to display it.

There are also additional guides that give you precise indicators on what needs to be done. For example, if you are asked to remove a part of bone, the part that needs to be removed will be highlighted, see Figure 33:

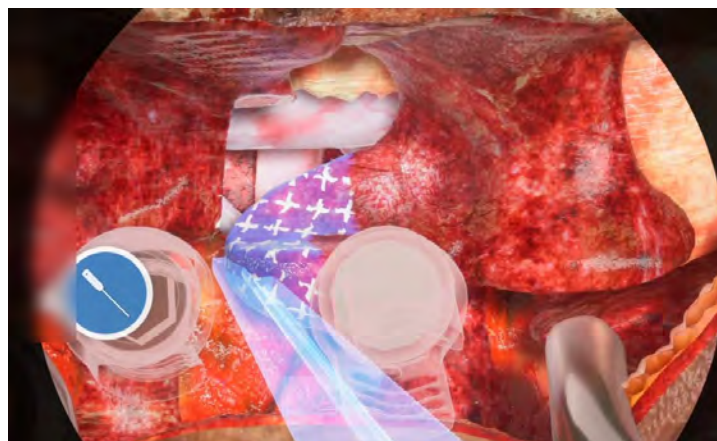


Figure 33 – Example of a blue highlighted zone guide for bone removal in TLIF technique.

You could also notice guides like blue markers and arrows on soft tissues (see Figure 34 for a ligament detachment step), or a dashed square to guide you with cutting (see Figure 35 for cutting the annulus of a vertebral disc).

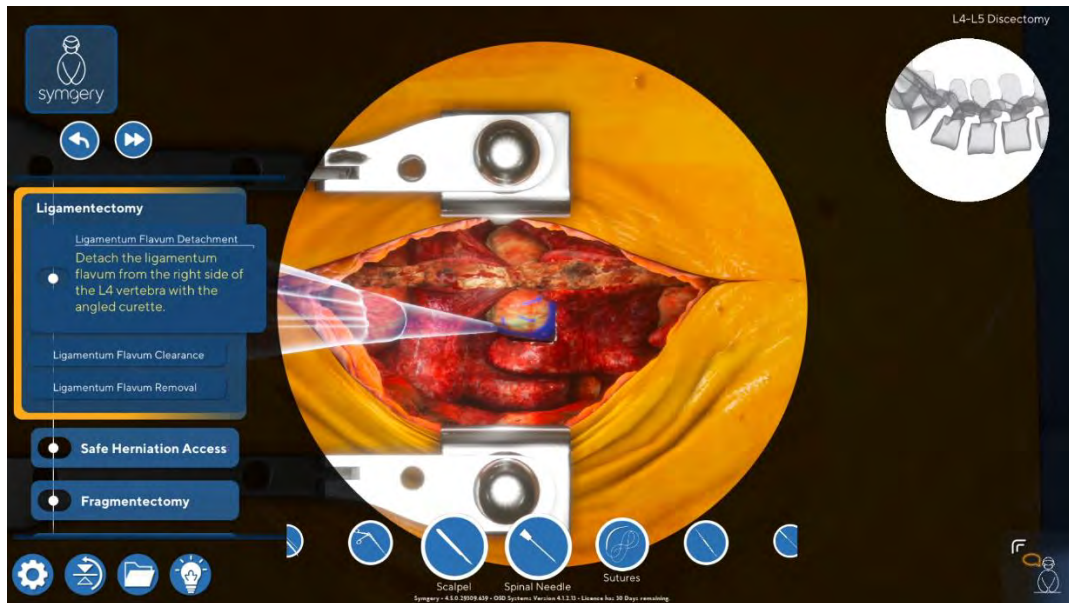


Figure 34 - Example of blue markers and arrows guides for Ligament detachment in L4-L5 Discectomy Patient Case.

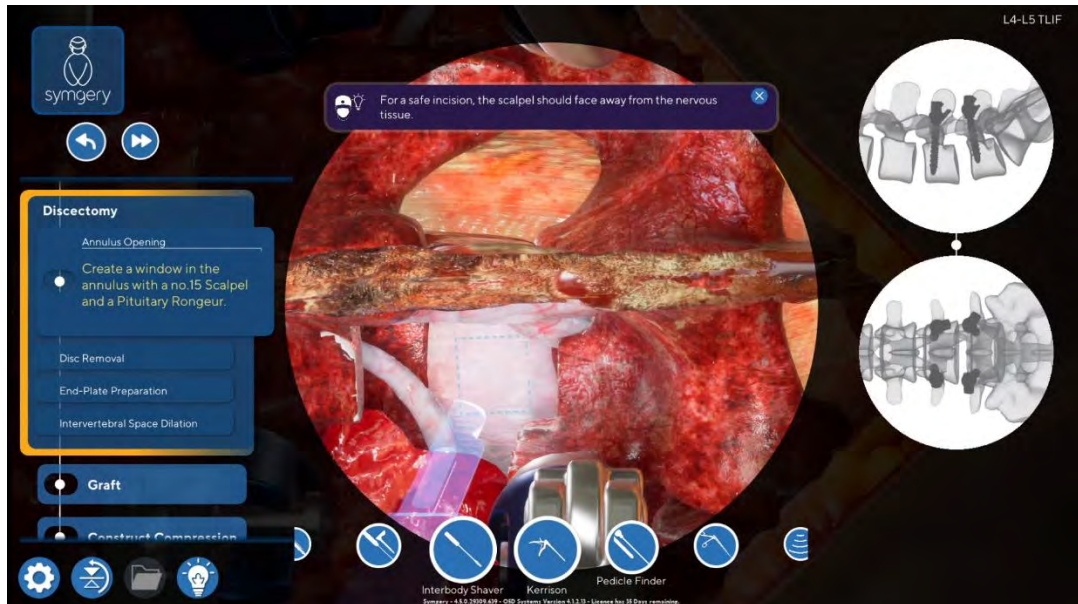


Figure 35 - Example of a dashed square guide for annulus cutting in TLIF Technique.

In the case of screw insertions, the guides will highlight where the screw is being placed and will provide you an idea of the depth that the screw needs to be placed with the X-ray, see Figure 36.

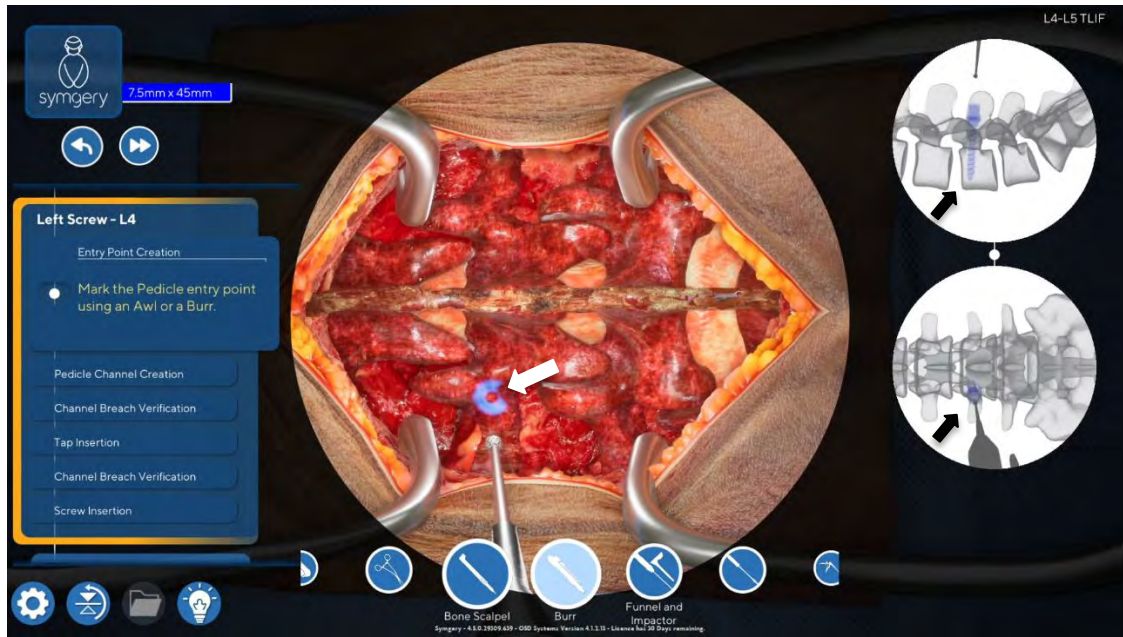


Figure 36 - Example of the entry point guide in the OR and the ideal Screw displayed in the X-ray in TLIF Technique.



### 3.5.4. Imaging System

To switch between the OR and the X-ray views, click on the mini X-ray at the top right of the screen to open the imaging system, or press on the Right pedal provided.

The imaging system allows users to take X-ray shots during the simulation with real time tools and bone rendering. Post-simulation X-rays are saved into the user's Dashboard.

#### Controlling the C-arm

Similar to the Camera rotation in OR view, place your finger on the touchscreen over the X-ray and slide your finger around. This will rotate the C-arm around the patient, allowing you to observe the X-ray from different angles. You may also zoom In and out of the X-ray with the pinching motion. To change the speed of the rotation, refer to the Control tab in the Settings panel, see section 2.1.2.

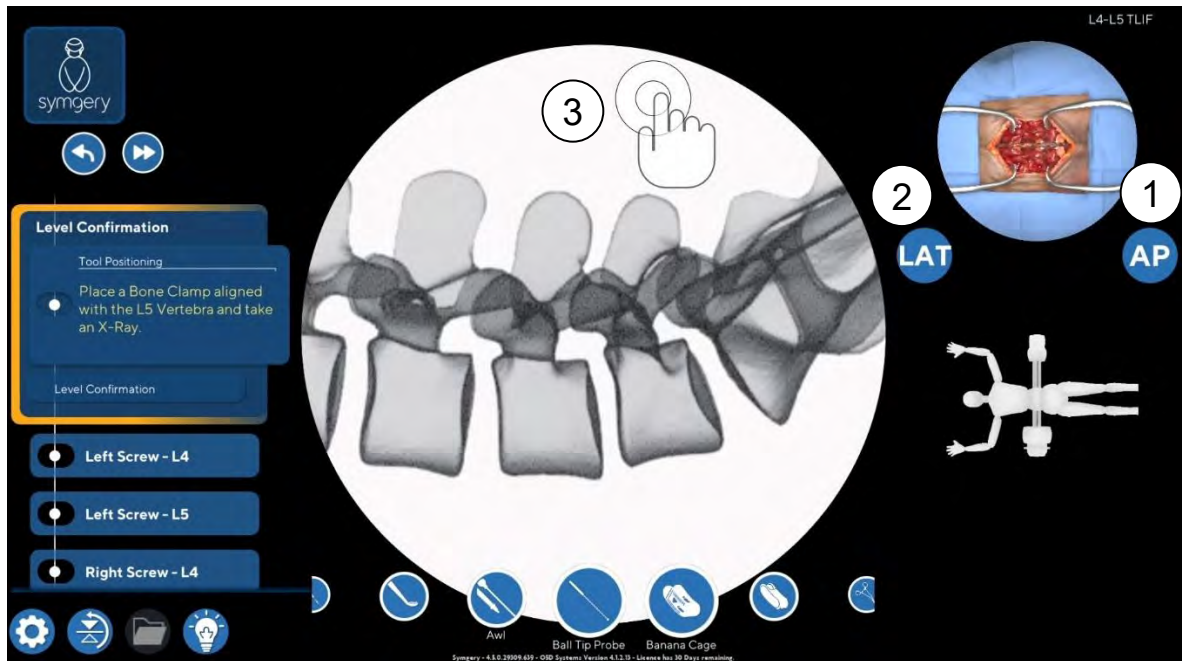


Figure 37 - X-ray Lateral (LAT) view example with L4-L5 TLIF Technique.

- 1 To take an AP shot click on the AP button. The X-Ray will be automatically reset to the standard AP view.
- 2 To take a LAT shot click on the LAT button. The X-Ray will be automatically reset to the standard LAT view.
- 3 If Real-Time X-ray is turned OFF in the Settings, take a shot by double tapping on the X-ray or using the Left pedal. This will not reset the X-Ray view.

Coming back to the OR view, note that the mini X-Rays on the right will always show the standard AP or LAT views.

## Using the pedals

In the Imaging System mode, press the Left pedal to take an X-ray. Ensure to have deactivated the Real Time X-ray in the Control tab in the Settings panel first.

In OR view, pressing on the Left pedal will activate the surgical tools as seen in section 2.2.1.

Press the Right pedal to switch between the OR and the X-ray views.



### 3.5.5. Results Screen

When you complete the simulation, you may notice the *Skip* button is changed to a *Results* button. Clicking on it will trigger a warning pop-up to confirm if you are ready to access the Results Screen, see Figure 38. Once in the Results Screen, you cannot go back to the procedure.

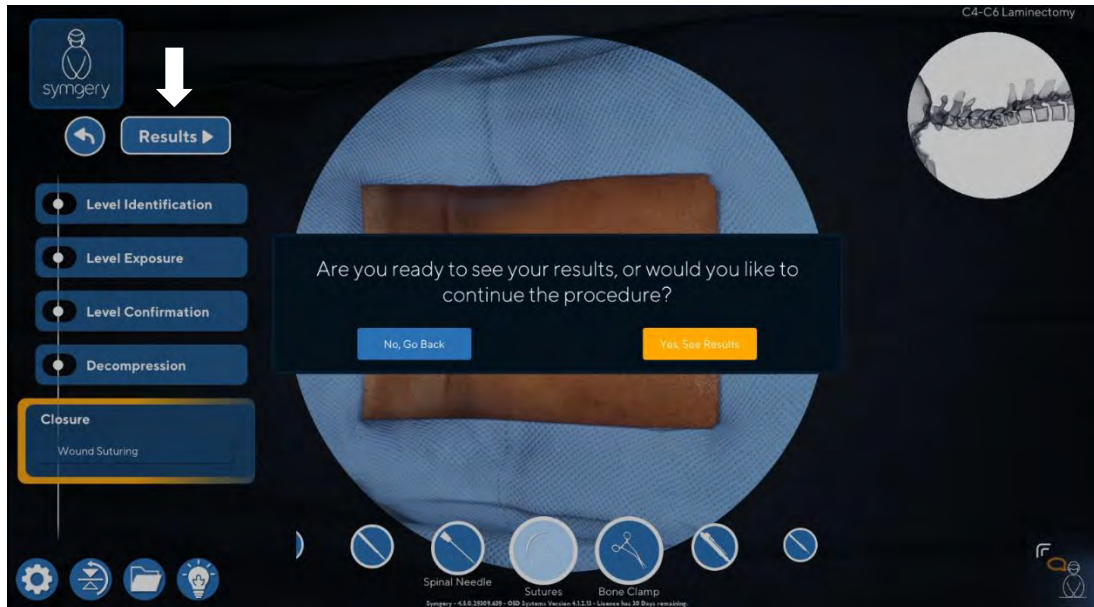


Figure 38 - Warning pop-up before going to the Results Screen.

The results screen will give you an overall score of the simulation attempt, a rotating vertebra that shows the result, and a detailed explanation of each step in the procedure, see Figure 39.

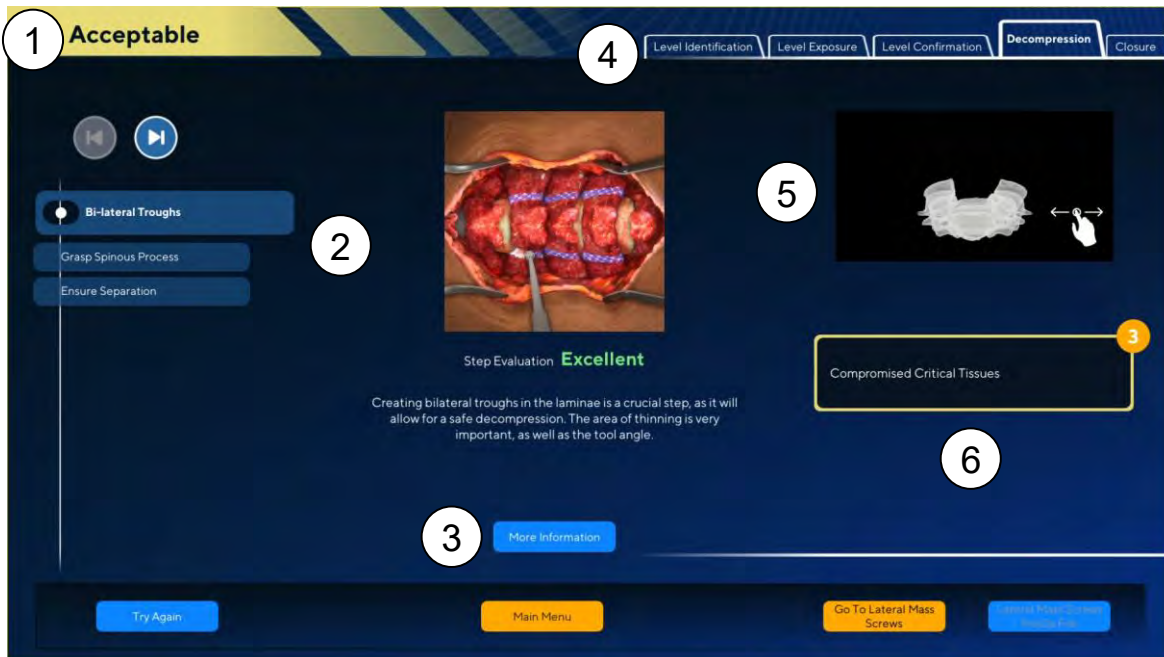


Figure 39 - Result screen example with C4-C6 Laminectomy Patient Case.

- 1 The global score of your attempt will be written on the top left: either excellent, acceptable, unacceptable or incomplete if not all the steps were completed.
- 2 On the left side, you will find a timeline similar to the one found in the simulation, indicating each step. Click on the *Back* or *Next* buttons to get detailed results for every step of the procedure.
- 3 The *More Information* box opens up a detailed explanation for each of the steps completed and explains what differentiates an excellent result to acceptable and/or unacceptable.
- 4 The *Tabs* represent the different Group steps during a procedure. Click on each Tab to access the different steps.
- 5 You will find the end result vertebra of the procedure completed. It can be rotated using one finger.
- 6 The box with a yellow border indicates the compromised critical tissues hit throughout the procedure. Click on it to get more detailed information.

### 3.5.6. Dashboard

A detailed Results Screen is available at the end of each procedure and saved into the user's Dashboard.

You can access your Dashboard by clicking on your Profile on the bottom right corner of the Navigation Menu. Your Dashboard will grow over time and will display your performance history for each procedure.

## 4. Support

This brings us to the end of our Software Guide. If you have any additional questions or need assistance, please contact us by email at:

[info@symgery.com](mailto:info@symgery.com)