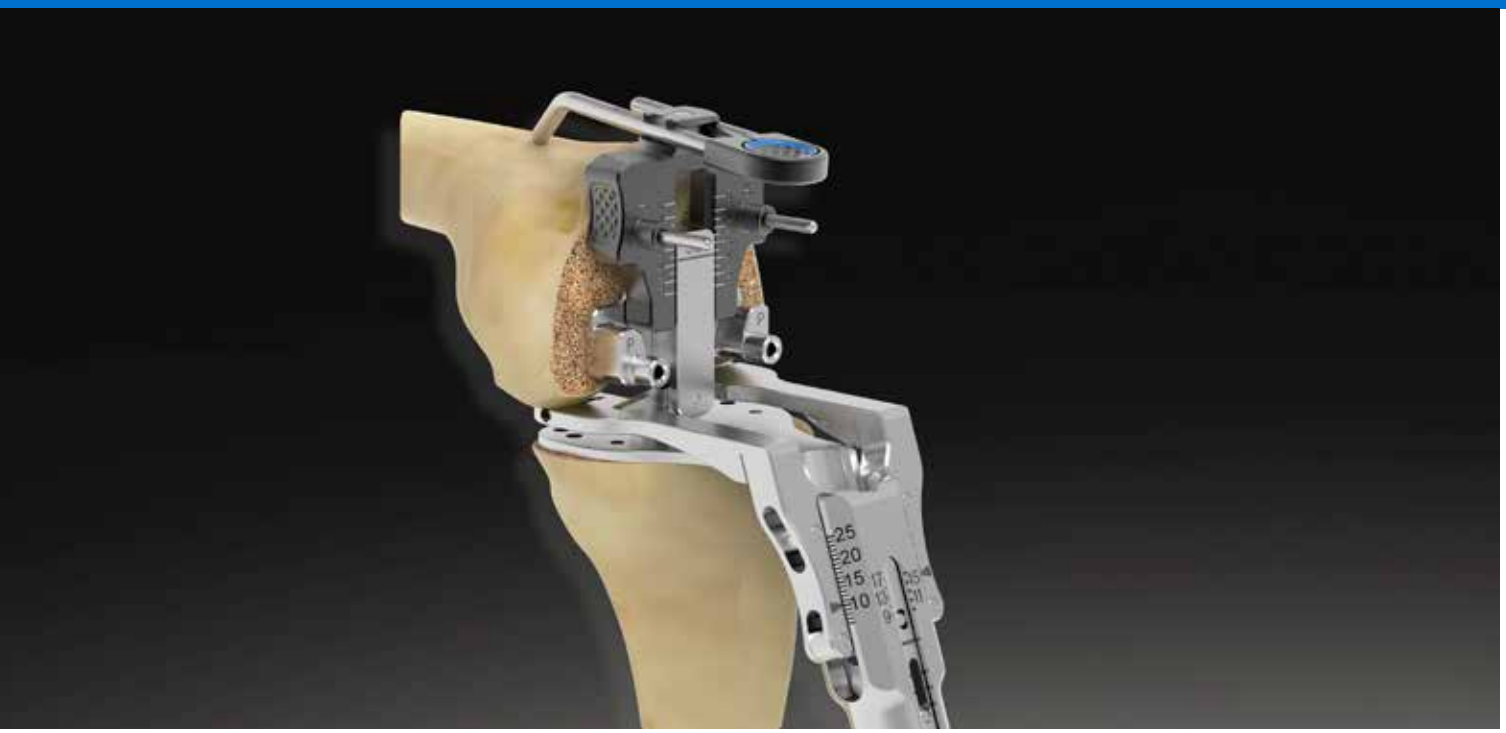
EXACTECH | **KNEE**

Operative Technique



TRULIANT®

TOTAL KNEE SYSTEM

Ligament Balancing System (LBS-3)

Exactech®

TRULIANT KNEE SYSTEM LBS-3

SURGICAL TECHNIQUE

INTRODUCTION

Well-balanced soft tissue and flexion/extension gaps are among the key objectives of total knee arthroplasty (TKA). The Truliant LBS-3 instruments are designed to help surgeon users practice ligament balancing techniques in TKA. The system consists of an LBS-3 Tensor which tensions the knee joint open in a load-controlled manner, and LBS-3 Adaptor instruments to allow femoral sizing and positioning of the Femoral Finishing Guide.

The Truliant LBS-3 system is fully compatible with the Truliant instrumentation system and workflow. It also supports both anterior referencing (recommended) and posterior referencing techniques.

SURGICAL TECHNIQUE

Follow the Truliant Operative Technique for resection of the distal femur and proximal tibia. It is important to ensure a precise tibial cut, as a varus or valgus tibial cut will affect the rotation of the femoral positioning in the LBS-3 technique.

EXTENSION BALANCING

Position the **LBS-3 Tensor** between the resected femur and tibia in extension *(Figure 1)*. The bottom plates of the Tensor are resting on the resected proximal tibia, and the top plates of the Tensor are touching the resected distal femur. Turn the Tensor handle until the ligaments are appropriately tensioned. It is important to recognize the Tensor's three marks representing three levels of force applied by the tensor *(Figure 2, blue arrow)*. The middle level is recommended although the surgeon can choose to use higher or lower force based on his/her preference and patient condition *(Figure 2, blue arrow)*. It is not recommended to use a force outside of the high and low marks. And it is important to use a consistent force with the tensor throughout the procedure. The extension gap measurement *(Figure 2, red arrow)* can be a combined result of both the force exerted on the tensor and the anatomy and soft tissue properties of the joint. Evaluation of the varus/valgus stability of the joint under tension can be completed prior to selecting a final gap measurement. The extension gap (mm) measurement and poly thickness (mm) measurement *(Figure 2,* green arrow) can be read directly from the Tensor.

Note: *The extension gap reading is the total joint space between the resected tibia and femur (thus the combined thickness of femoral and tibial implants), while the poly thickness reading is the tibial implant thickness only.*

The medial and lateral extension gap measurements are independent; however, an ideal gap of a rectangular joint space should result in close measurements on both sides. Adjustments may be made to the soft tissue or bone resections if the gap is not rectangular.

Figure 1
Place Tensor in Extension

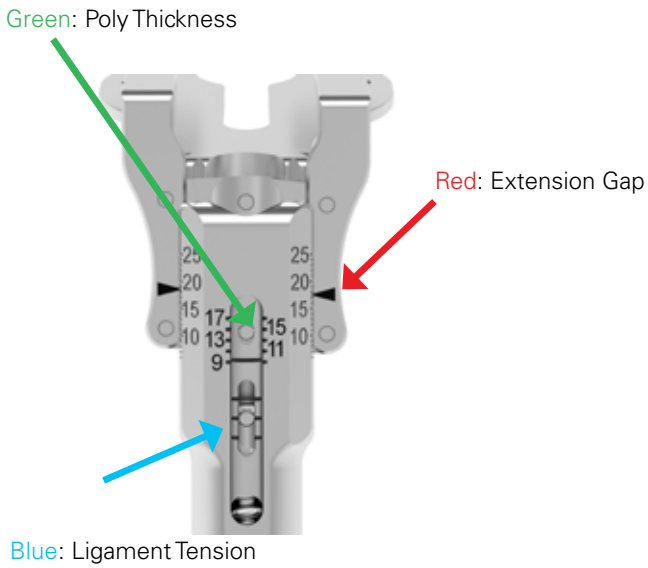


Figure 2
Tensor Markings

Figure 3a
Assemble the LBS-3 Instruments

Figure 3b
Place LBS-3 Instruments at Knee Flexion

The poly thickness measurement is an average of the medial and lateral extension gap measurements. If the poly thickness measurement is less than 9mm, the extension gap can't accommodate the minimum thickness of implant construct thus additional bone resection might be needed.

Once a rectangular joint space with a minimum 9mm height is achieved at extension, remove the Tensor from the joint.

FLEXION BALANCING AND SIZING

Assemble the Truliant LBS-3 Adaptor Anterior Body, Posterior Body and Stylus together, and slide the LBS-3 Adaptor onto the LBS-3 Tensor *(Figure 3a)*.

Flex the knee at 90 degrees of flexion, and place the instruments into the joint *(Figure 3b)*:

- The bottom plates of the Tensor are resting on the resected proximal tibia;
- The top plates of the Tensor are touching the posterior condyles of the femur;
- The Posterior Body of the Adaptor is flush against the resected distal femur surface;
- The Anterior Body of the Adaptor slides open to allow the Stylus to rest on the anterior cortex of the distal femur.

Keep the knee at 90 degrees of flexion and verify the Posterior Body of the Adaptor is flush against the resected distal surface of the femur *(Figure 3b)*. Tense the joint open by turning the Tensor handle to the previously identified tension mark in extension.

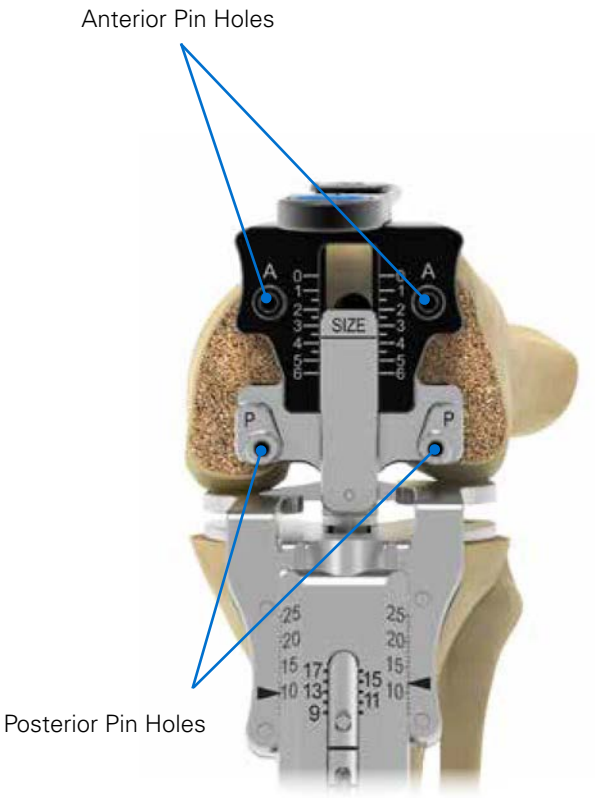


Figure 4
Anterior and Posterior Pin Holes

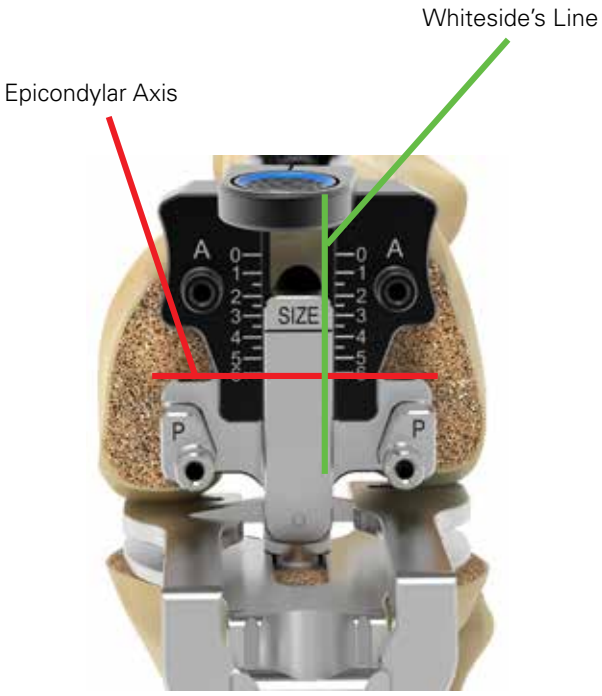


Figure 5
Use Anatomical Landmarks as Reference

The rotation of the femur under tension is a result of the properties of the ligaments and soft tissue around the knee and differs on each patient. Therefore, the LBS-3 technique offers a personalized ligament-balancing technique that defines the femoral implant position according to the biomechanical response of the patient's soft tissue.

With the LBS-3 Adaptor instruments, the two pairs of pin holes (one pair on Anterior Body and one pair on Posterior Body) are parallel to the proximal tibial cut and will be used to position the Femoral Finishing Guide *(Figure 4)*. As a result, the Femoral Finishing Guide will create a rectangular space for the flexion gap, considering the patient's individual soft tissue properties.

Before proceeding to the next steps, anatomical landmarks can be used to verify and fine-tune the femoral rotation if desired (i.e., the sliding bar between the Anterior Body and Posterior Body should be parallel with Whiteside's line, and the pin hole pairs should be parallel to the epicondylar axis of the femur) *(Figure 5)*.

Figure 6a
LBS-3 as Femoral Sizer

Figure 6b
Setting Stylus to Match Size

Figure 7
Reading Femoral Size

In addition to setting femoral rotation, the LBS-3 Adaptor also serves as a sizer for the femur. Slide the Anterior Body and place the tip of the Stylus underneath the quadriceps and into the suprapatellar pouch. Palpate the position of the Stylus tip, trying to make it rest in the midportion of the femoral metaphysis *(Figures 6a and 6b)*. The size marking between Anterior Body and Posterior Body reads the size for the femoral implant *(Figure 7)*. Keeping the Stylus length match with the Anterior Body size reading will increase the sizing accuracy *(Figure 6b)*.

The Truliant LBS-3 instruments can support either anterior referencing (AR) or posterior referencing (PR) technique.

- The AR technique prioritizes implant position on the anterior aspect of the femur when the bone is measured between sizes. The advantage is that it minimizes notching risk, while the disadvantage is that the posterior joint line could change slightly in between-size scenarios.
- The PR technique prioritizes implant position on the posterior aspect when the bone is measured between sizes. The advantage is that it maintains a constant posterior joint line, while the disadvantage is the increased notching risk in between-size scenarios.

With the Truliant implant system having a small between-size jump in the anteroposterior (AP) direction (only about 2 mm), the practical difference between AR and PR techniques is minimal at approximately 1 mm. In addition, the Truliant Femoral Finishing Guide features AP shifting holes that allows additional fine-tuning of implant position. Because of this ability to fine-tune the flexion gap later in the surgical flow and being less sensitive to errors, the AR technique is usually recommended over the PR technique when using the Truliant LBS-3 system.

Figure 9a
Anterior Referencing Technique using Anterior Pins

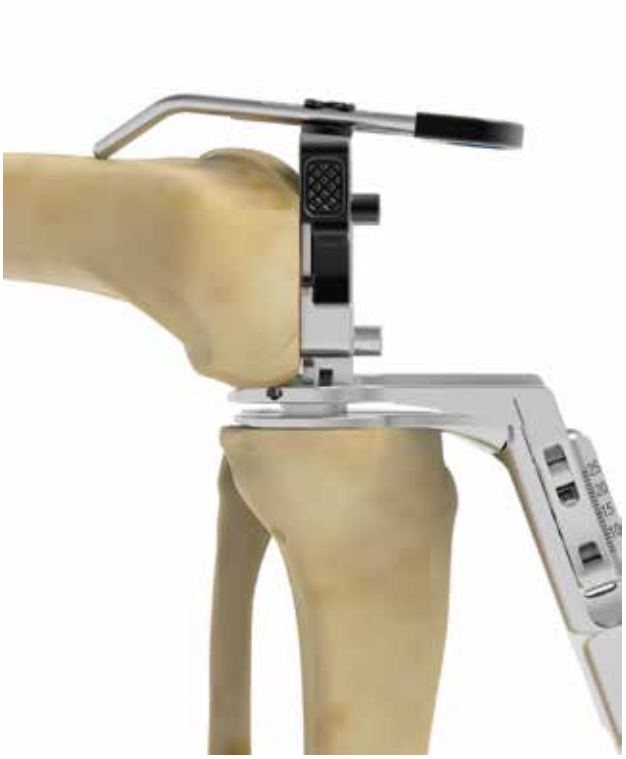


Figure 8
Ensure Posterior Body is Flush with Distal Femur during Pinning

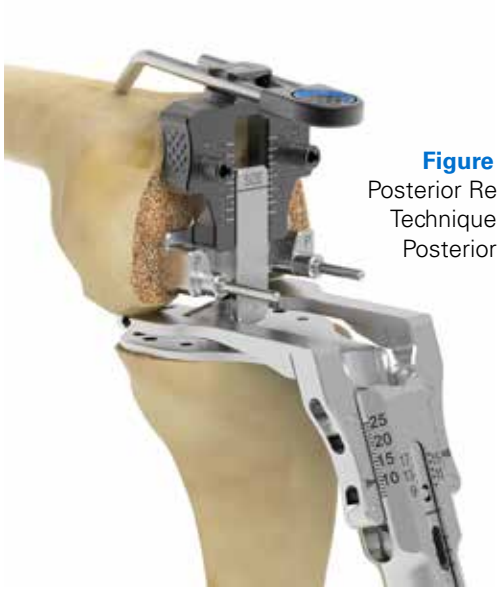


Figure 9b
Posterior Refrencing Technique using Posterior Pins

Ensure the back surface of the Posterior Body is sitting flush with the distal femur cut (this requires the knee being flexed at 90 degrees) *(Figure 8)*. Insert two headless pins into the pin hole on the Anterior Body (marked with letter "A") if the surgeon uses AR technique *(Figure 9a)*, or the pin holes on the Posterior Body (marked with letter "P") if the surgeon uses PR technique *(Figure 9b)*. These alignment pins will later be used to position the Femoral Finishing Guide.

Note: *It's critical in the PR technique to ensure the Posterior Body is flush with the distal femur when placing the pins. If the Posterior Body isn't flush, the position and/or orientation of the pins could be off which may increase risk of incorrect sizing and anterior notching during femoral finishing.*

The LBS-3 Tensor and Adaptor instruments can now be removed from the joint, leaving the two alignment pins in place. The pins lock the rotation of the Femoral Finishing Guide and then the femoral implant.

At this step, additional fine-tuning of the flexion gap can be achieved by using the following methods:

1) If flexion gap is larger than desired, the surgeon could shift the Femoral Finishing Guide posteriorly (for smaller adjustment) or consider upsizing the femur (for larger adjustment).

2) If flexion gap is smaller than desired, the surgeon could shift the Femoral Finishing Guide anteriorly (for smaller adjustment) or consider downsizing the femur (for larger adjustment).

None of these adjustments will affect the femoral rotation that was previously determined by the soft issue properties.

Figure 10
Place Pins with Only Posterior Body

Figure 11
Temporary Pinning Posterior Body and Easing Anterior Body for Sizing

Some technique variations could be used based on the user's preference:

- When surgeons use a PR technique, they could assemble the Posterior Body of the Adaptor to the LBS-3 Tensor first, without assembling the Anterior Body and the Stylus at the same time. Follow all other steps and place the alignment pins into the "P" holes while ensuring the back surface of the Posterior Body is flush with the distal femur cut *(Figure 10)*. After the Posterior Body is fixed with the pins, the Anterior Body and Stylus can then be assembled to do the femoral sizing.
- When surgeons use a AR technique they may opt to put two provisional pins (can be headed pins) to the "P" holes to temporally secure the Posterior Body and ease the manipulation of the Anterior Body and Stylus during sizing *(Figure 11)*. These two extra pins need to be removed before removing the LBS-3 Tensor and Adaptor instruments from the joint.

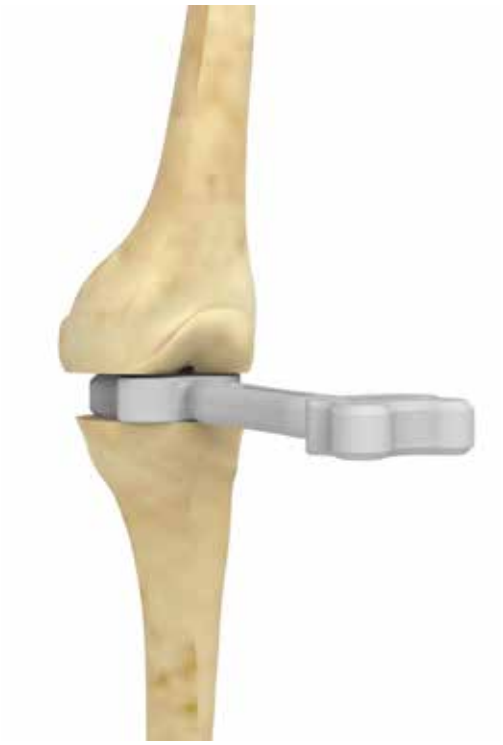


Figure 12
Use Spacer Block at Extension

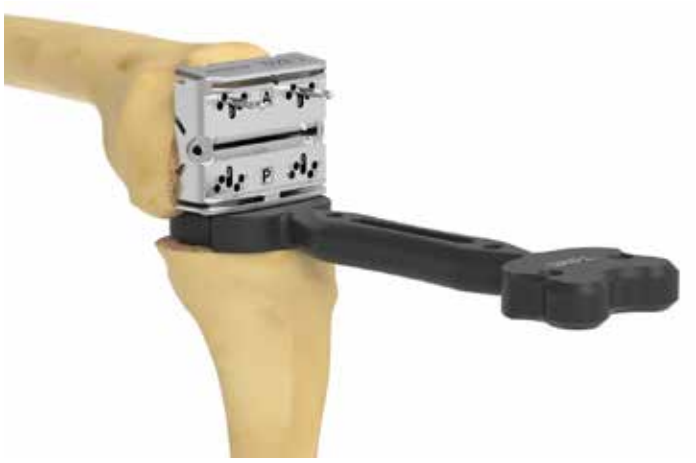


Figure 13
Use Spacer Block at Flexion

USE OF SPACER BLOCKS AS ADDITIONAL ASSESSMENT TOOL

The Truliant Spacer Blocks can be used as additional tools for checking extension and flexion gaps.

At extension, after proximal tibia/distal femur cuts and any desired soft tissue release, Truliant Spacer Blocks can be used to confirm rectangular joint space that's at least 9mm height *(Figure 12)*.

At flexion, the joint space can be checked prior to bone resection by using a spacer block placed below the bottom flat surface of the Femoral Finishing Guide. The distance between the posterior slot and the bottom of the Femoral Finishing Guide is 4mm, thus the spacer block selected should be 4mm less than the target space *(Figure 13)*.

If the flexion gap is deemed larger or smaller than desired, previously described fine-tuning methods (shifting Femoral Finishing Guide or size adjustment) can be used.

The Truliant Spacer Block system consists of 5-15mm options with the combination use of a 1mm Shim. A 1mm Shim can be added to these Spacer Blocks to form 6, 8, 10, 12mm options. Another 4mm Shim is also available when 17mm or more is needed.

Resume surgery following the Truliant Operative Technique.

CATALOG NUMBER	DESCRIPTION	
207-80-10 521-50-08	LBS-3 Tensor LBS-3 Tensor (with augment slots)	
02-029-42-1000	Truliant LBS-3 Adaptor, Posterior Body	
02-029-42-1100	Truliant LBS-3 Adaptor, Anterior Body	
02-029-42-1200	Truliant LBS-3 Adaptor, Stylus	
02-029-90-2040 02-029-90-2010 02-029-90-2020	Truliant Spacer Block, 5mm/7mm Truliant Spacer Block, 9mm/11mm Truliant Spacer Block, 13mm/15mm	
02-029-90-2100 02-029-90-2120	1mm Shim for Spacer Blocks 4mm Shim for Spacer Blocks	

**Special Order Only*

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Exactech, Inc. is proud to have offices and distributors around the globe. For more information about Exactech products available in your country, please visit www.exac.com

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For additional device information, refer to the Exactech Knee System–Instructions for Use for a device description, indications, contraindications, precautions and warnings. For further product information, please contact Customer Service, Exactech, Inc., 2320 NW 66th Court, Gainesville, Florida 32653-1630, USA. (352) 377-1140, (800) 392-2832 or FAX (352) 378-2617.

Exactech, as the manufacturer of this device, does not practice medicine, and is not responsible for recommending the appropriate surgical technique for use on a particular patient. These guidelines are intended to be solely informational and each surgeon must evaluate the appropriateness of these guidelines based on his or her personal medical training and experience. Prior to use of this system, the surgeon should refer to the product package insert for comprehensive warnings, precautions, indications for use, contraindications and adverse effects.

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