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# INSIGHT Clinical Guide



How to understand and use  
INSIGHT System data

How to use INSIGHT System to  
improve clinical outcomes

Understanding the prosthetic  
socket fitting with INSIGHT  
System



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## WHY INSIGHT?

When evaluating the fit of a prosthesis, there are several factors to consider: weight fluctuations, shape changes, the normal wear and tear of daily life all play a role in the overall comfort of the prosthetic socket. As prosthetists, it is crucial to observe any changes in the residual limb's shape or size, which could compromise the fit of a socket, putting the patient at risk for skin breakdown.

Changes in a prosthetic user's diet or activity level can drastically affect the volume of the limb, causing the socket to become looser or tighter. Any prolonged exposure to adverse pressure over the limb's soft tissues can lead to unnatural body movements, fatigue blisters and ultimately wounds.

An ill-fitting socket has the potential to cause rubbing, discomfort, skin breakdown and ulceration, therefore, minimizing changes in the fitting is an important part of maintaining a good socket fit. It can be difficult for patients to articulate the feeling of a socket due to issues with neuropathy.

One solution to achieve an appropriate socket shape and volume is through the use of INSIGHT Data to derive explanations for any problems encountered during the fitting process.

Additionally, conditions such as phantom limb pain, neuromas and invaginated scarring create hurdles that can be difficult to overcome for even the most skilled clinician. With INSIGHT System mapping capabilities, the prosthetist now has another tool to not only identify adverse pressures within the socket, but also objectively verify the appropriate fit of a socket before the patient walks out the door.

This Guide will help you to understand how to use INSIGHT Data to improve clinical outcomes and better understand the prosthetic socket fitting with INSIGHT System.



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## ADVERSE VS. EXPECTED PRESSURES

Pressure is always expected during weight bearing. A prosthetist can use various methods to shape and reduce the volume of a mold to induce pressure where he wants it to occur. These are expected pressure areas.

It is when those pressures elevate and localize on the limb over a prolonged period that they can become adverse, putting the patient at risk of discomfort and eventual skin breakdown.

With INSIGHT Data, the ability to observe weight bearing pressures is in the palm of the clinician's hand. The Prosthetist will gather data to determine:

- If appropriate pressures are being applied in pressure tolerant areas (Figure 1);
- If reliefs built into socket are sufficiently offloading bony and, painful prominences;
- If global volume reduction is appropriate for total surface bearing.

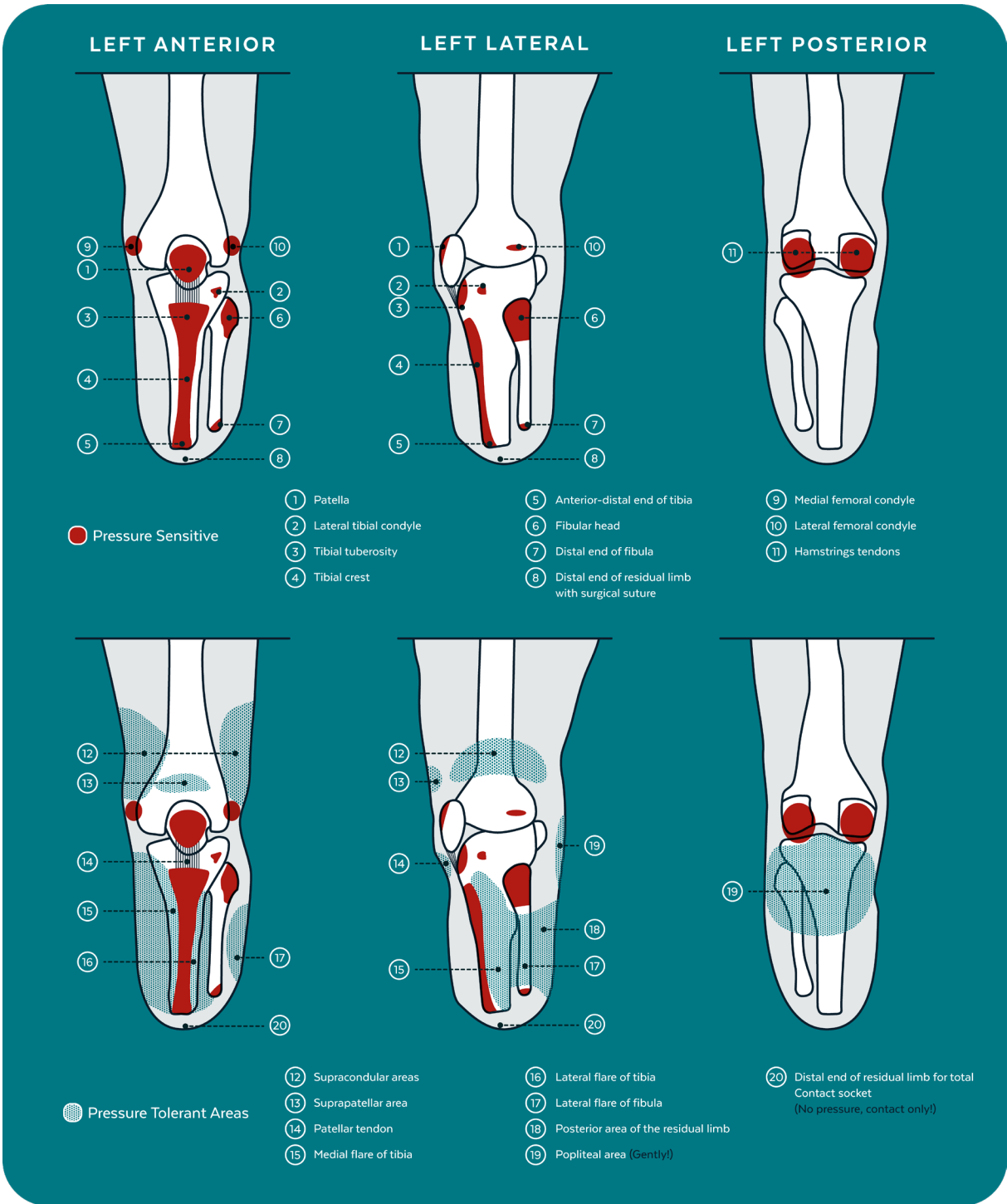


Figure 1: Visuals of pressure tolerant and intolerant areas on a below-knee residual limb.

# HOW TO INTERPRET PRESSURE DATA PROVIDED BY INSIGHT SYSTEM?

## Relative pressures

The INSIGHT System provides pressure data to the user in a Relative Pressure mode. What does this mean? The system reads the overall pressures being captured and visualizes them in a gradient which correlates to the lowest and highest pressures being measured within the socket, on that specific moment.

The scale is only relative to the areas its gathering data on. It's up to the clinician to determine proper placement and attain the visuals desired.

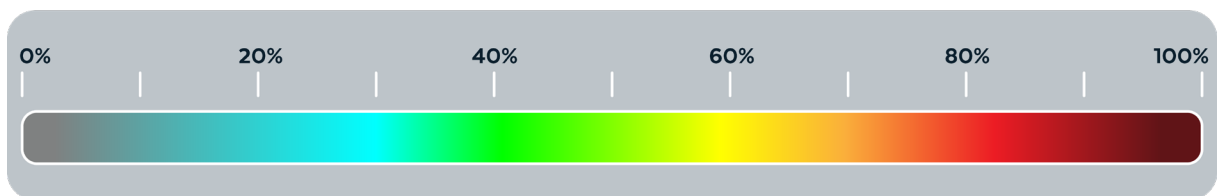


Figure 2: Color scale used in INSIGHT System.

- Blue represents the lowest measured pressure.
- Red represents the highest measured pressure.

## The color red

In Relative mode, the color red does not necessarily mean adverse pressure, but it means it is the highest pressure being read by the system, at that moment.

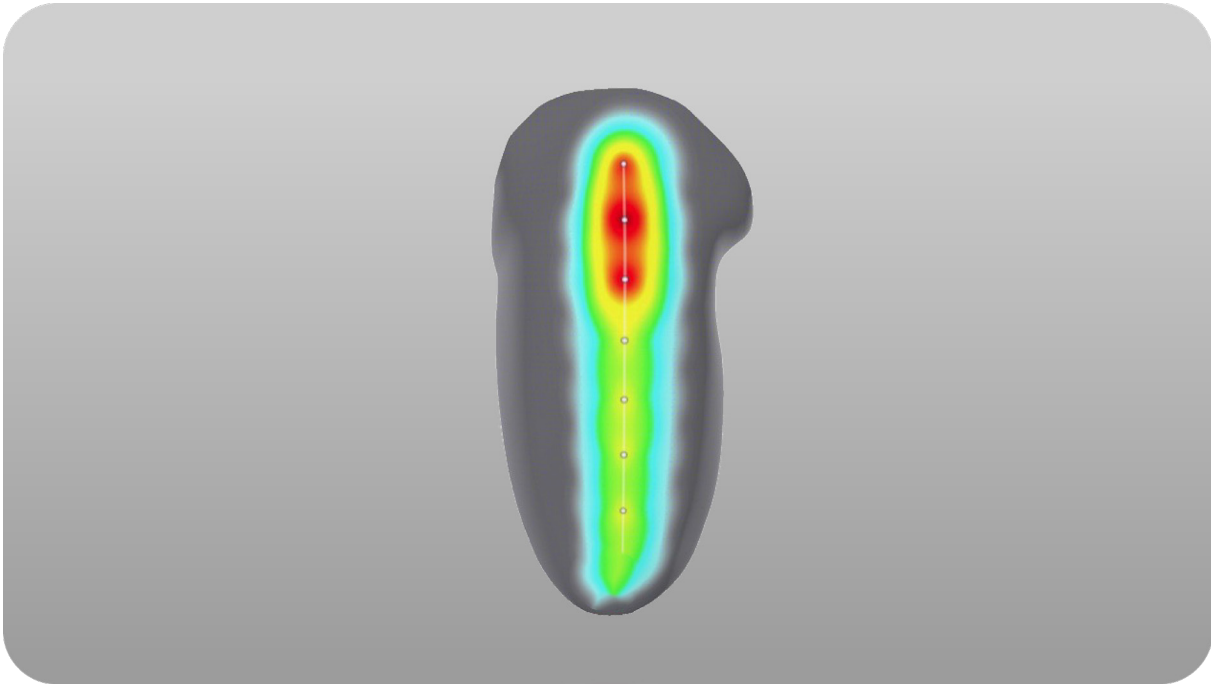


Figure 3: Example of localized pressure on the proximal-medial wall

- Localized red “hotspots” can often cue the practitioner into pressure points (Figure 3).
- While globalized redness spread along the entirety can correlate to a correct total surface bearing.



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## TIPS AND TRICKS

Making your way through your first pressure acquisition with the INSIGHT System can at times be overwhelming. Below are helpful tips and tricks to ensure useful pressure data is acquired.

### Where to place INSIGHT Sensors?

Do you know where the fit issue is occurring? Is the patient stating discomfort, but unable to articulate where? With using the INSIGHT System, you can place up to 8 sensors inside the socket to perform a pressure analysis. Usually, a below-knee prosthesis will require four sensors for an accurate representation, while an above-knee prosthesis requires at least six sensors. However, the number and position of sensors depends on the prosthetist, the socket, and the patient's history.

Before starting an acquisition, remember that:

- INSIGHT Sensors must not overlap
- You can't use repeated sensor IDs. Sensor ID can be found at the proximal edge of the sensor strip.

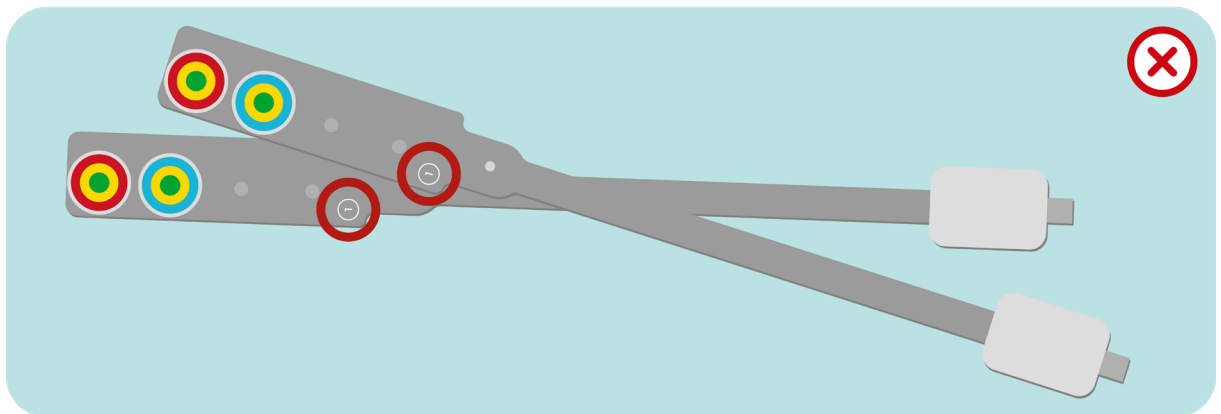


Figure 4: Do not overlap and repeat sensor IDs

### Point pressure theory

In Relative mode, strips should be placed on opposite walls of the socket (anterior-posterior, medial-lateral, etc.)

Pressures in the socket often present in pairs. As such, each pressure will typically present with a similar pressure on the opposite wall. Medial-proximal pressure will correlate with distal-lateral. In Relative mode, it's important to always place at least one strip opposite each other to visualize these opposing pressures accurately (Figure 5).

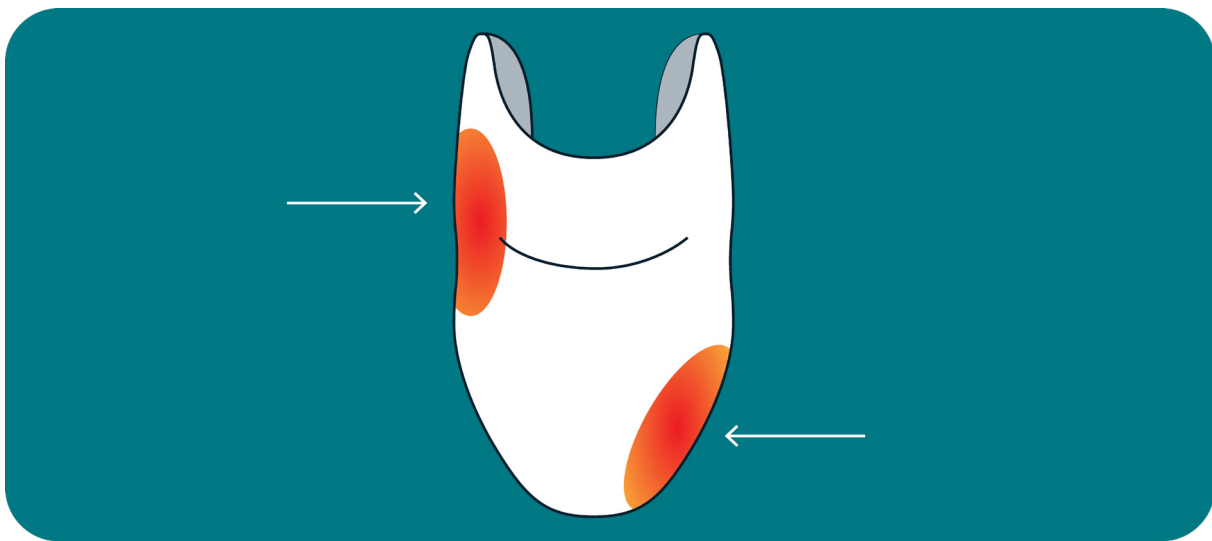


Figure 5: Pressure pair examples.

### How to place INSIGHT Wearable and WIMU

Normally, INSIGHT Wearable will be placed around the socket and INSIGHT WIMU on the other segment of the leg:

- IE – if the amputation is above the knee, INSIGHT Wearable should be placed around the socket and INSIGHT WIMU below the knee (on the pylon).

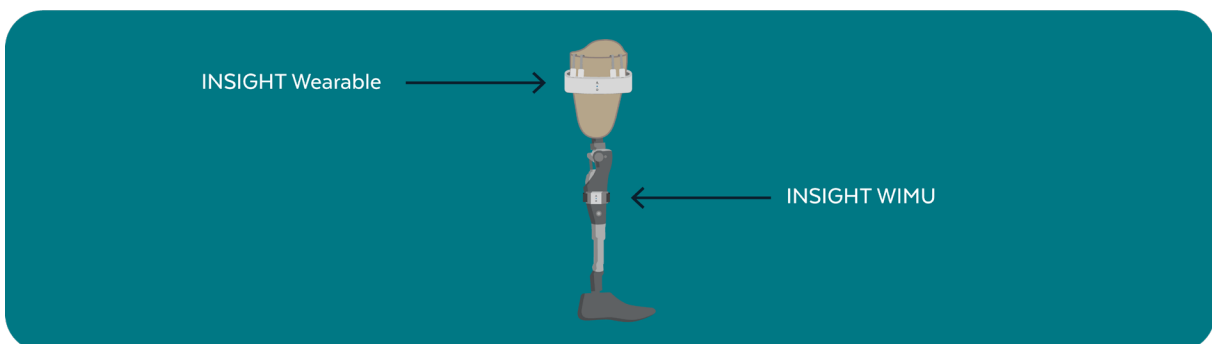


Figure 6: Example of INSIGHT Wearable and INSIGHT WIMU on an AK prosthesis.

- If the amputation is below the knee, INSIGHT Wearable should be placed around the socket and INSIGHT WIMU above the knee.

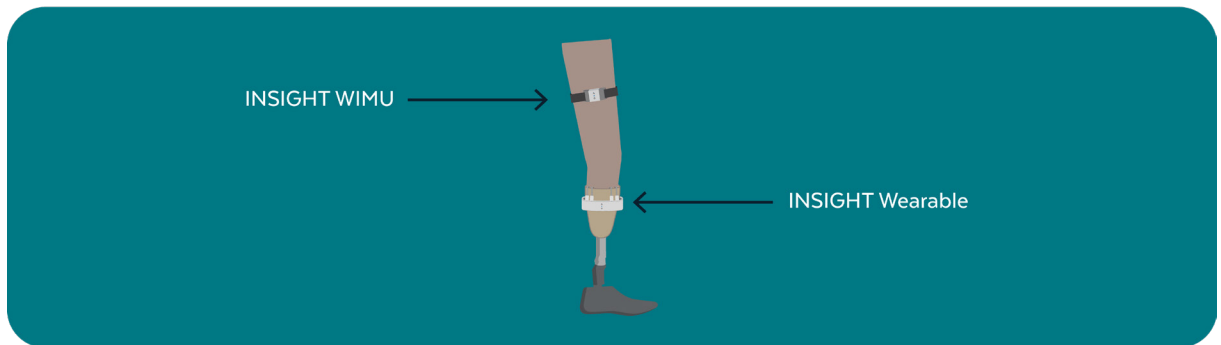


Figure 7: Example of INSIGHT Wearable and INSIGHT WIMU on an BK prosthesis (without knee sleeve).

- At times, it may be necessary for the prosthetist to swap the placement of the INSIGHT Wearable and WIMU. (Figure 8). In this will happen when:
  - The patient uses a knee sleeve
  - The prosthetist wants to use more than 4 sensors on a below-knee prosthesis. On this case, he will need to use a Medium Size INSIGHT Wearable.

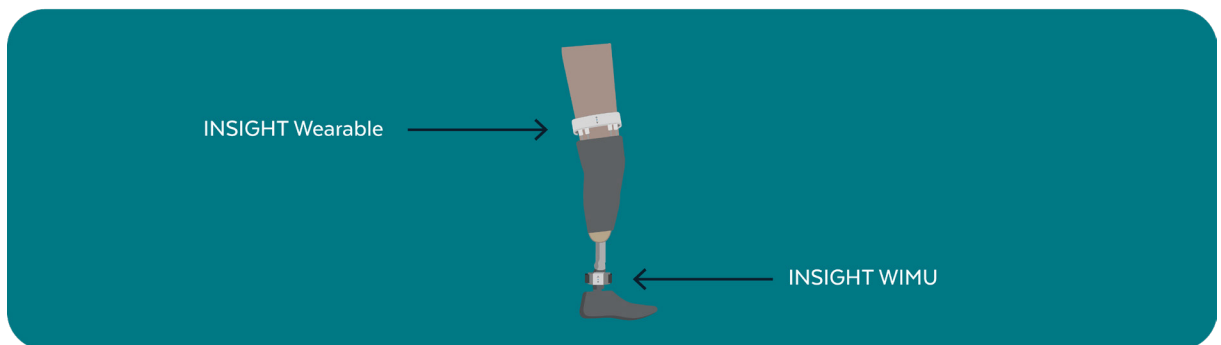


Figure 8: Example of INSIGHT Wearable and WIMU position.

It's important to have both components well fixed around the socket/ pylon. If the patient doesn't use a cosmesis and the INSIGHT WIMU needs to be placed on the pylon, Adapttech has created an .STL file for a WIMU holder (Figure 9) that can be printed.

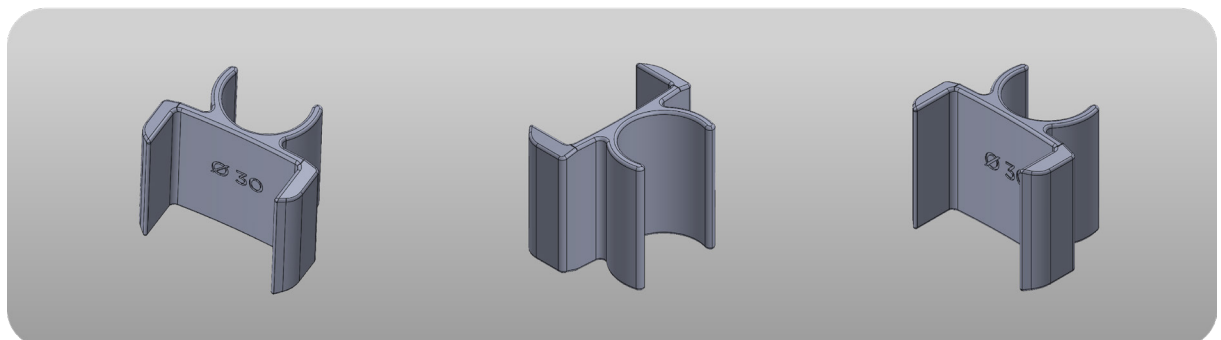


Figure 9: WIMU holder - available for 30mm and 34mm pylon.

## Tricky suspensions

### Seal-in

Some Seal-in liners can alter the pressure presentations. Lack of contact around the membrane may cause the visual seen in Figure 10.

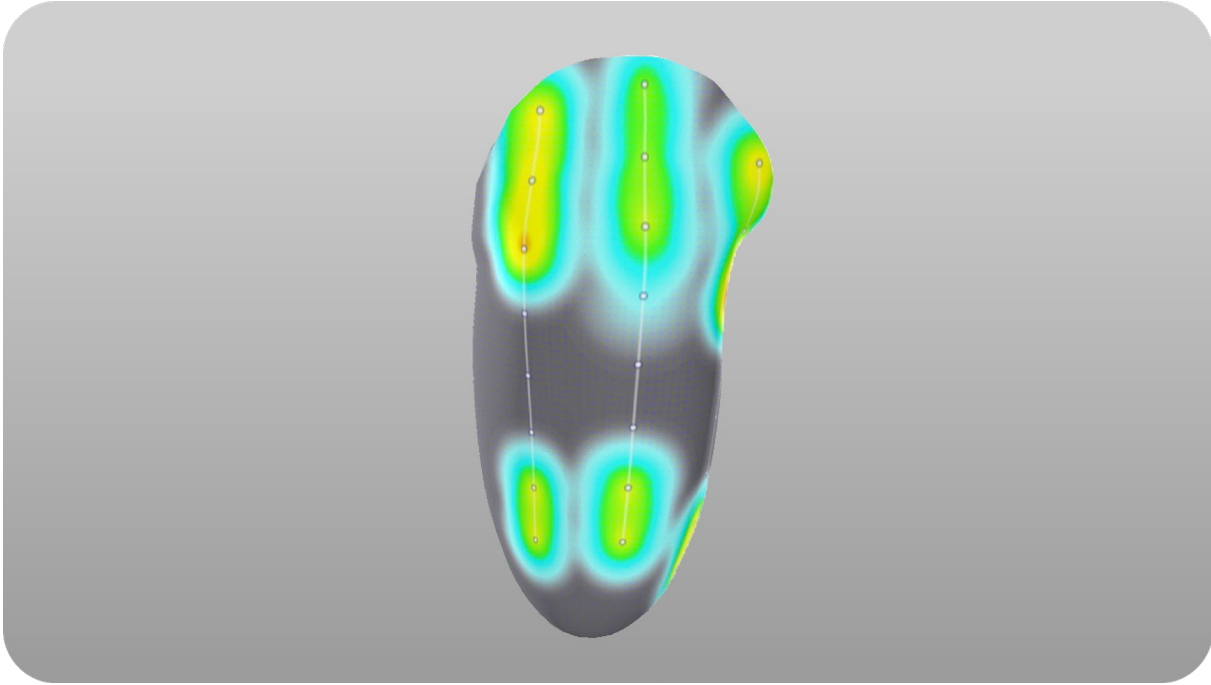


Figure 10: What pressure may look like.

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## SOCKET FITTING - INSIGHT PROCESS

The recommended INSIGHT-fitting process follows along with the workflow of a traditional socket fitting and can easily be adapted to fit the style of a specific clinician.

The first step, as always, is to verify volume. After an entry is created and sensors are placed inside the socket, fit the prosthesis to your patient and check volume. If the prosthesis is put on whilst the patient is seated, and the need for socks is observed prior to standing - do so prior to doing a static acquisition.

If the volume is appropriate, then proceed to alignment. The practitioner can then utilize the INSIGHT System to observe how socket shifts influence pressure points to fine tune the alignment. If the alignment is appropriate but pressure persists, the last step is to modify the socket. Socket modifications are less easily reversed and are encouraged to be the last option to take as such. This process it's called volume-alignment-modifications (VAM).

Below is the recommended process for socket fitting:

### Recommended process

#### Static fitting

1. It's important to first verify if the socket's volume is appropriate. With the patient standing still- verify the volume.
2. Place INSIGHT Wearable and WIMU and connect them to INSIGHT App.
  - Tip: Adjust the length of the INSIGHT Wearable before placing it around the socket.

3. With live view, verify volume. Often, the patient dons the device and after a few minutes of standing, you may end up needing a sock due to fluid loss. The volume can be visualized and verified by observing global pressures.
  - Higher pressures observed distally could cue the clinician to add socks.
  - Lower distal pressures and higher condyle pressures could be a sign of “over-socking”.
4. Once the volume has been verified, it’s time to proceed to static alignment and static acquisition (Warning: verify if static acquisition is selected. By default, dynamic acquisition is selected on the INSIGHT App. Static acquisition takes at least 30 seconds of the patient standing (Figure 11). After 30 seconds, the app will process the peak pressures recorded and present them in a static 3D model. Alternatively, an unprocessed recording of the entire process can be viewed to pinpoint specific moments during the fitting process.



Figure 11: How to select static or dynamic acquisition.

- Prosthetists are aware of the impact a socket’s alignment can have on overall comfort for the user. In using the INSIGHT system during initial socket fitting and alignment, the clinician gets a live feed of what the patient may or may not be experiencing.
  - Cue patient to shift weight as you normally would, observe alignment and correlating pressure points – Alter as necessary.
5. Obtain neutral alignment as you normally would. (Figure 12)

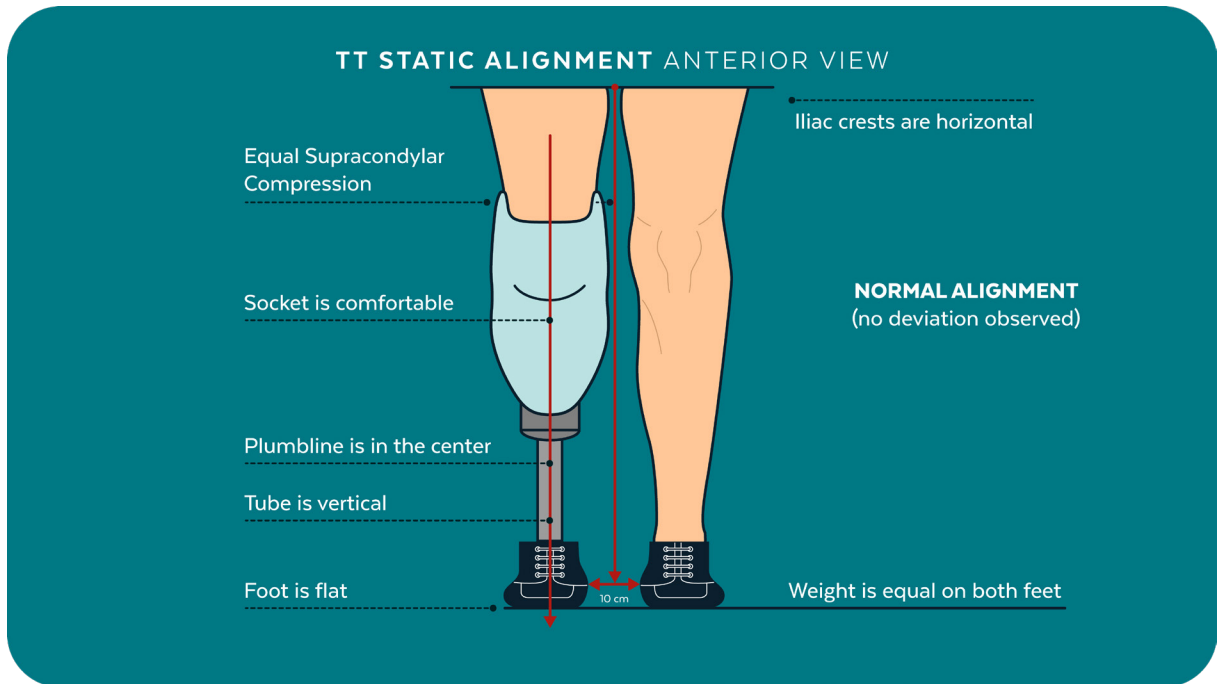


Figure 12: Transtibial socket alignment - anterior view.

6. Once obtained, verify that there are no concerning pressure points.
7. If Volume and Alignment are appropriate – look at socket mods (VAM).
8. Verify if patient is stable and comfortable.

#### Dynamic fitting

1. Proceed to dynamic acquisition if all aspects of static fitting are verified, and the patient is comfortable walking.

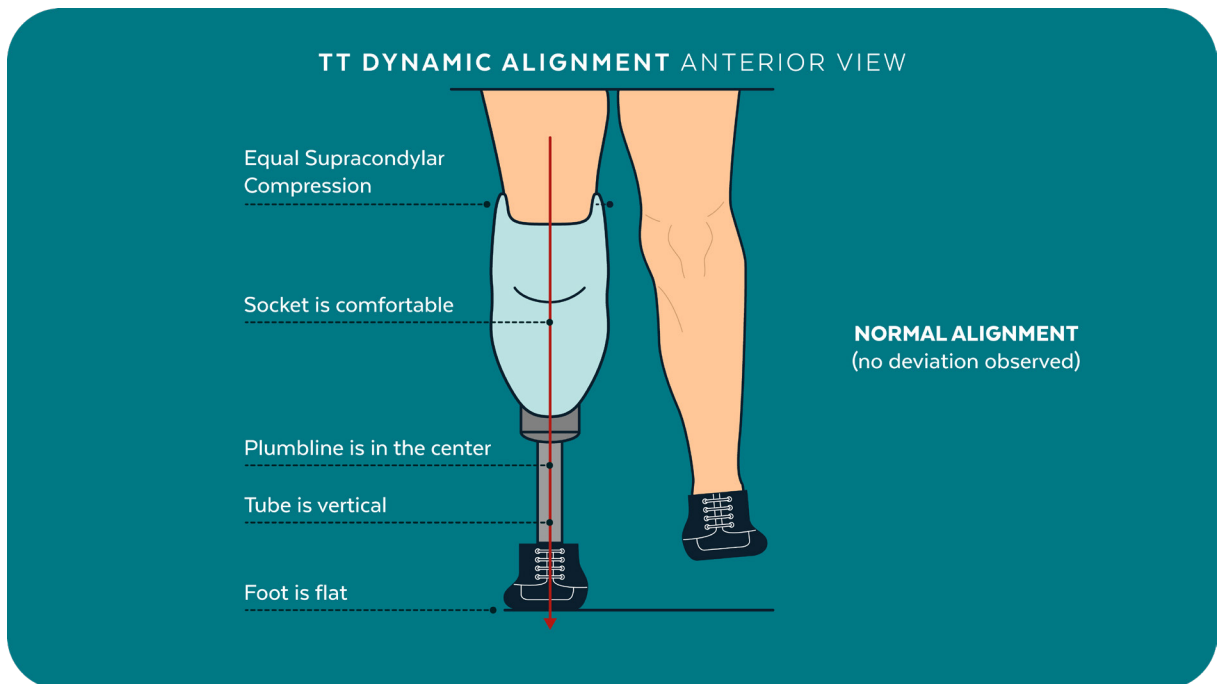


Figure 13: Observation during midstance phase with full weight bearing on prosthesis.

2. Press record and wait 5 seconds before asking your patient to walk. This allows the INSIGHT Wearable and INSIGHT WIMU to communicate with each other and calibrate their position.
3. After at least 60 seconds of ambulation, stop the acquisition and check the processed view.
4. Compare to an “appropriate fit” pressure visual (Figure 14).

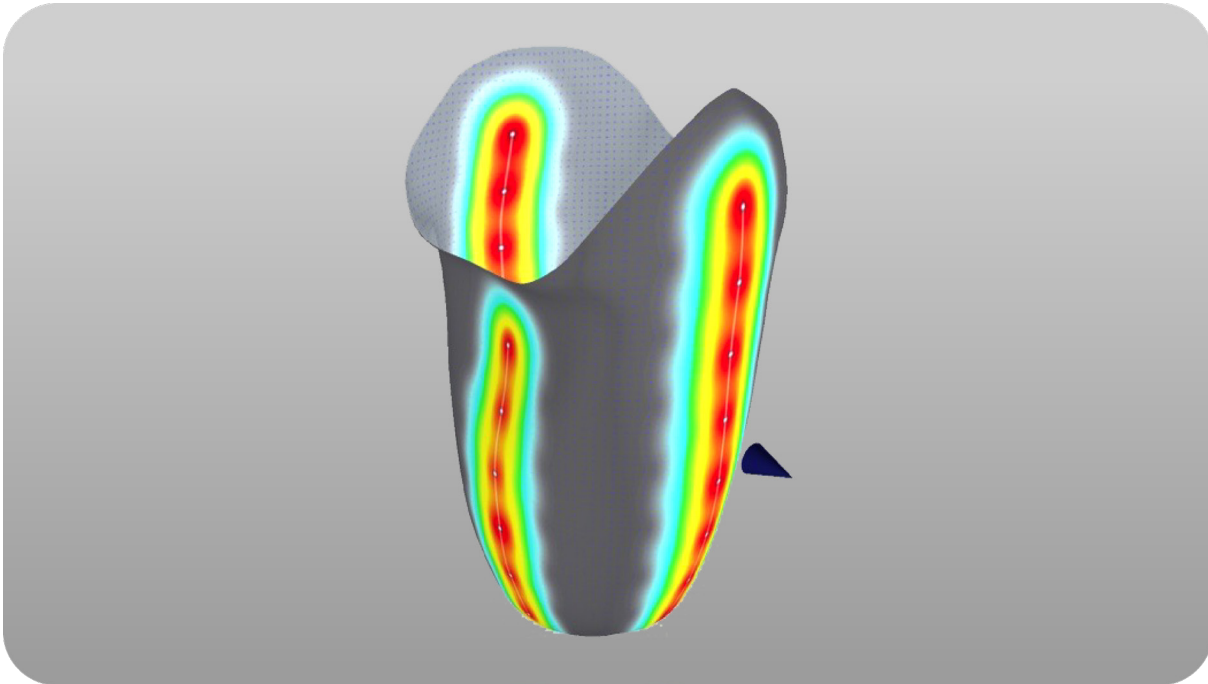


Figure 14: Example of total contact and appropriate distribution of pressure along total surface bearing socket.

5. Verify Volume
  - Has volume remained consistent?
    - Higher pressure visualized distally
    - Add sock to restore proper volume
  - Has volume remained consistent?
    - No mods necessary
6. Verify alignment: Can you change alignment to relieve adverse pressure?
  - Yes: Which phase of gait is the pressure occurring?
    - Can the socket angle be changed to alter pressure?
    - Can the socket be offset or slid to alter pressure?
    - See next section for possible pressure issues and solutions
  - No: alignments changes are not affecting the dispersion of pressure
7. Socket modifications:
  - Heat and alter socket
  - Go back to mold and alter



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## ISSUES PER GAIT PHASE

The INSIGHT system becomes quite helpful when determining what may be occurring at each phase of the gait cycle. After one minute of ambulation, the Wearable Inertial Units can process the data received and parse it into 5 main gait phases. Through the INSIGHT App the clinician can view the pressure distribution at each of these phases to decide how to proceed.

### Loading Response

High pressures anterior-distal / posterior-proximal or mix of both  
**Visual from INSIGHT App**

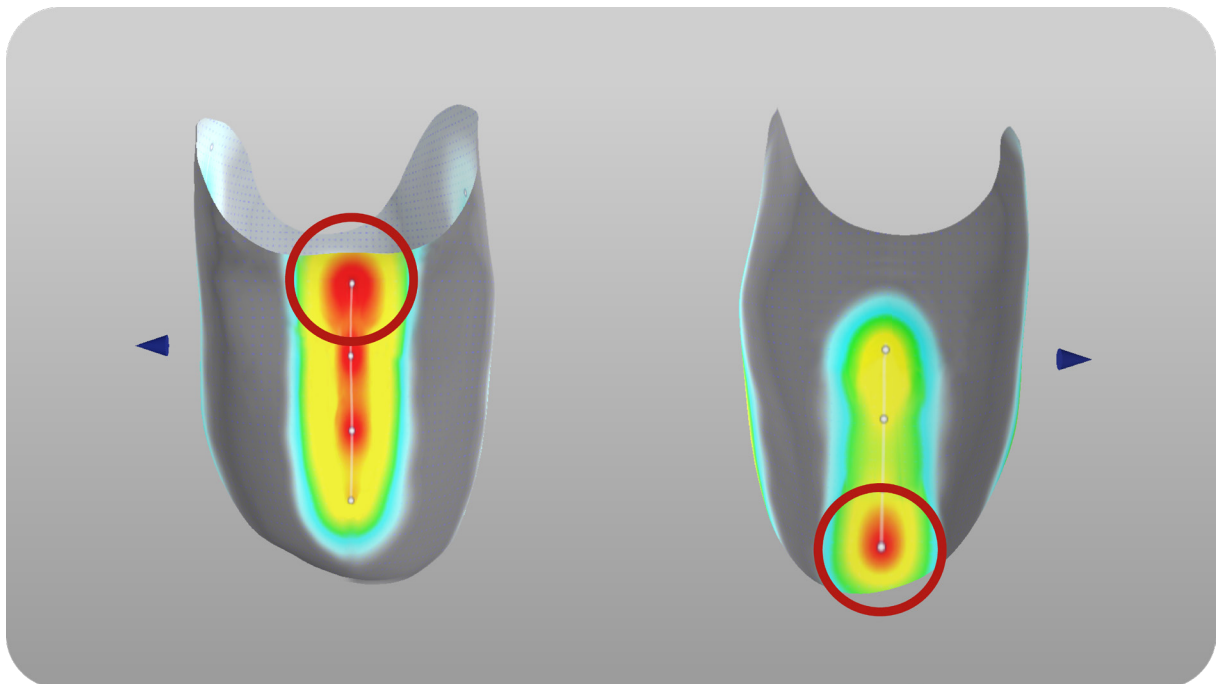


Figure 15: Example of high pressures anterior-distal and posterior-proximal on a below-knee socket.

### Potential mal-alignment associated:

- Excessive flexion of the socket
- Anterior displacement of the socket
- Heel too high or firm in durometer

This type of visualization is typically associated with a reduced toe lever causing:

- Rapid and premature knee flexion
- Premature forefoot contact (slap foot)
- Longer prosthetic step

## Visuals

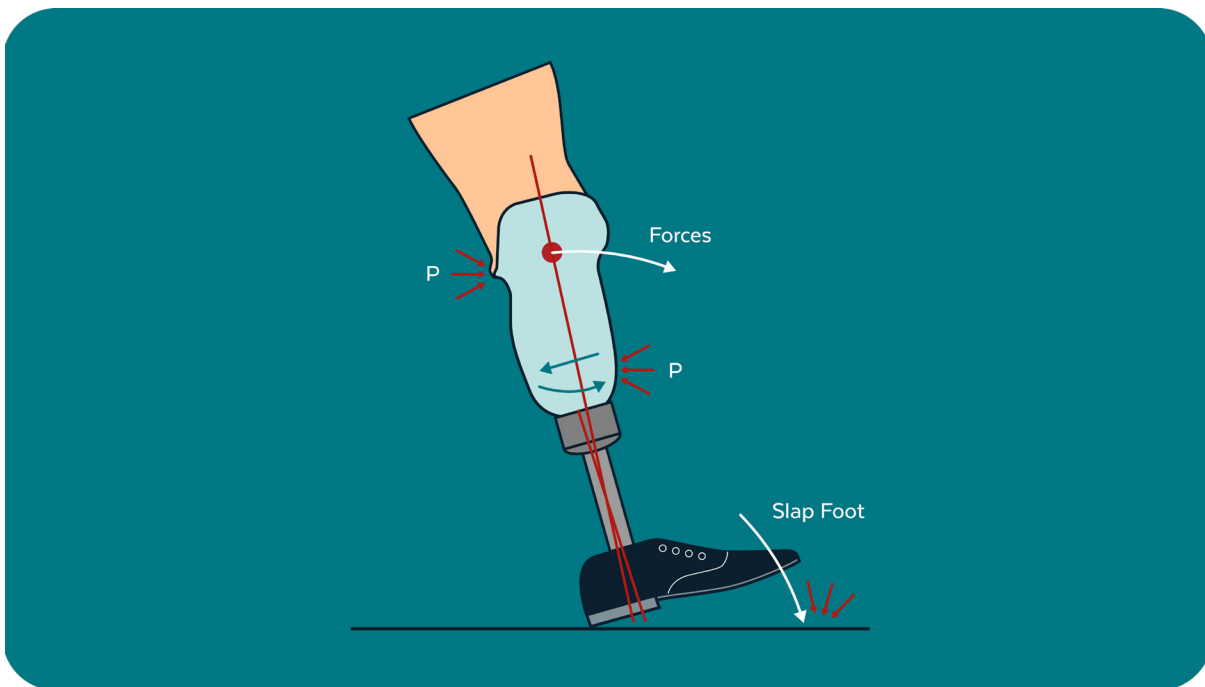


Figure 16: Example of gait deviation (lateral view) - high pressures present on anterior-distal / posterior-proximal.

## Solutions

By establishing a proper toe-lever we can reduce the pressures experienced in these areas at Loading Response via:

- Extending socket
- Posterior translation of the socket
- Change shoe / decrease heel category

Sometimes alignment changes yield no noticeable pressure change in these areas. This can be due to:

- Insufficient Distal tibia relief – Heat relief or plaster mod
- Low posterior Brim – create higher brim on mold

High pressures anterior-proximal at patella / posterior distal or mix of both

### Visual from INSIGHT App

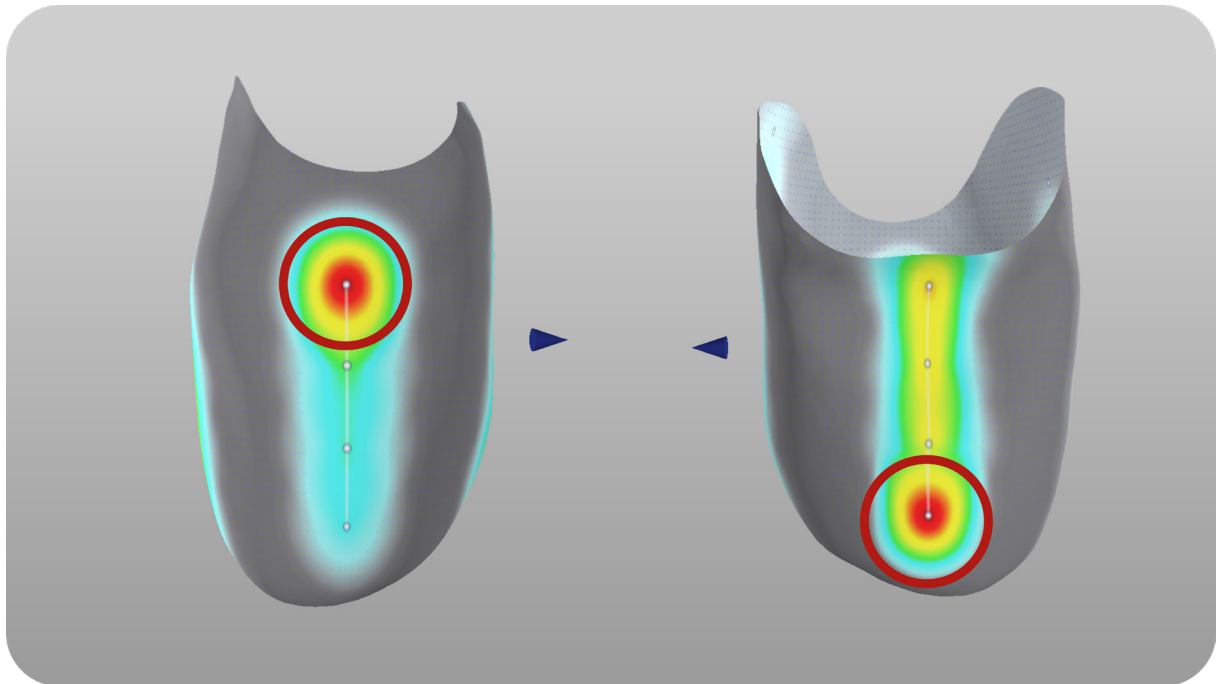


Figure 17: Example of high pressures anterior-proximal at patella and posterior-distal on a below-knee socket.

#### Potential mal-alignment associated:

- Excessive posterior socket translation
- Socket set in excessive extension
- Low heel durometer

#### This type of visualization is typically associated with a reduced heel lever causing:

- Excessive or hyperextension of the knee while progressing into stance
- Patellar pain/discomfort
- Shorter prosthetic step

## Visual

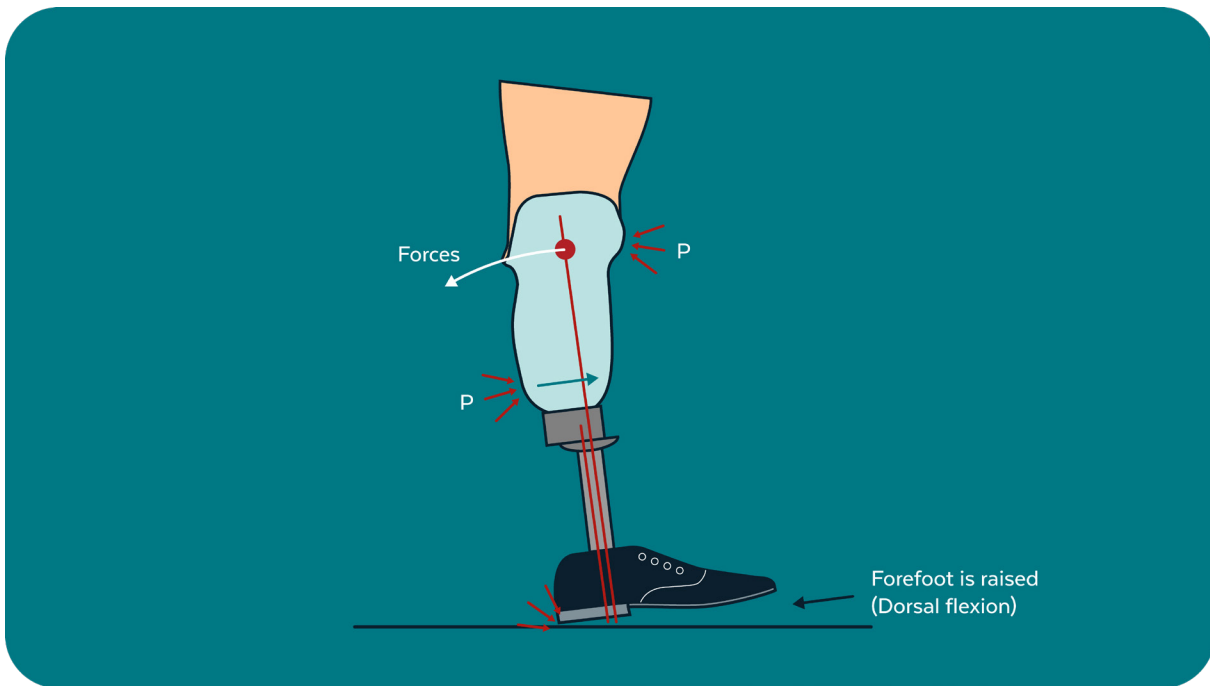


Figure 18: Example of gait deviation (lateral view) -High pressures anterior-proximal at patella / posterior distal or mix of both

## Solutions

- Anterior translation of the socket
- Flex socket
- Change shoe / use lower heel category

## Midstance

High pressures medial-proximal / distal-lateral or mix of both

## Visuals from INSIGHT App

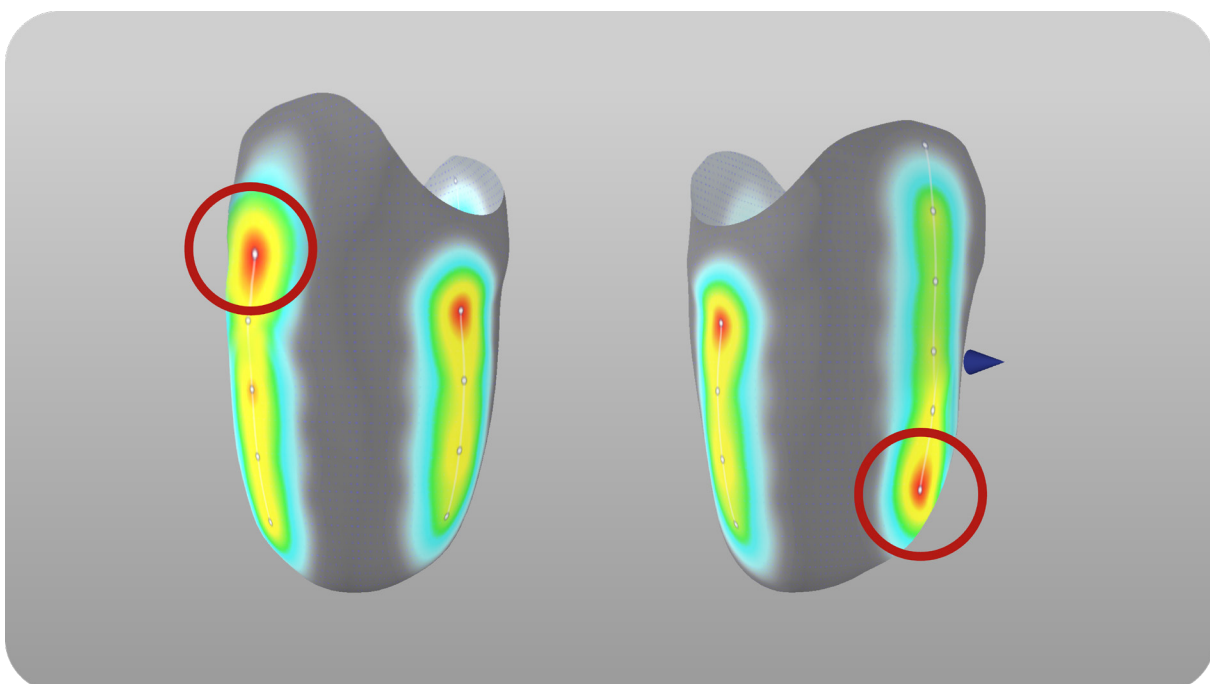


Figure 19: Example of high pressures medial-proximal / lateral-distal on a below-knee socket.

### Potential mal-alignment associated:

- Excessive abduction of socket
- Excessive socket outset

This type of visualization typically occurs when the weight line translates too far laterally in the stance phase causing:

- Lateral pylon lean
- Gap at lateral supracondylar area
- Discomfort or pain medial proximal/distal lateral
- Lateral trunk bend
- Narrow base of gait

### Visuals

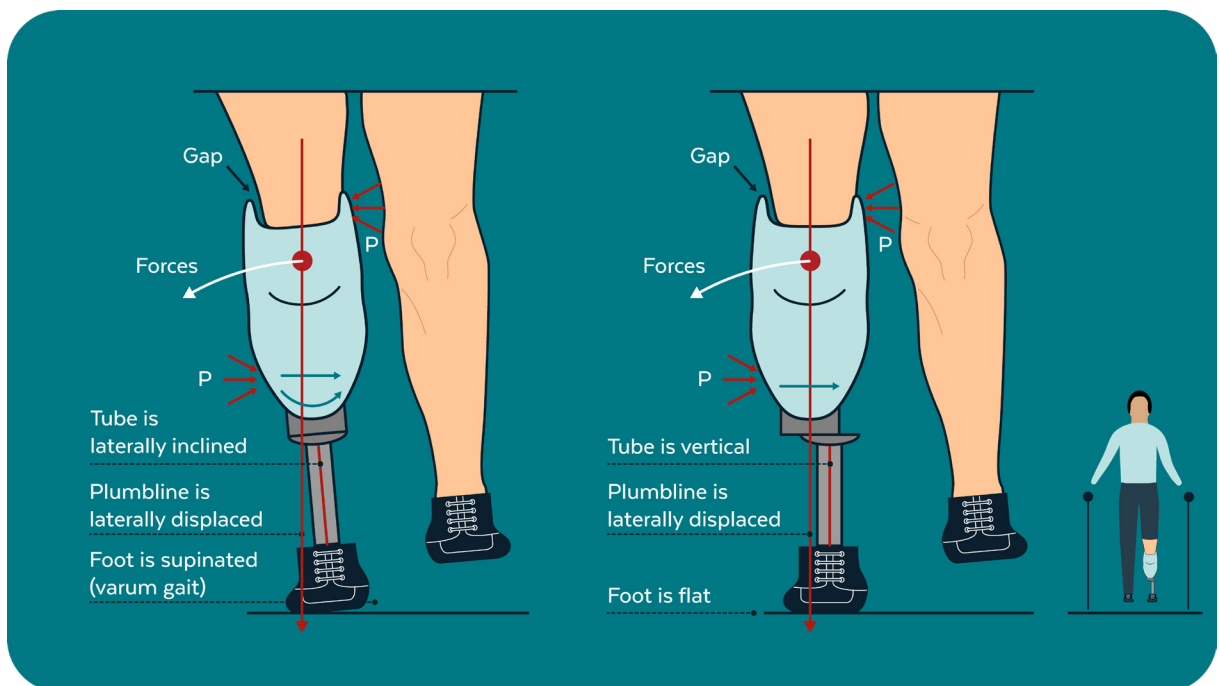


Figure 20: Example of gait deviation (anterior view) -High pressures medial-proximal / lateral-distal or mix of both.

### Solutions

- Adduction of the socket
- Medial translation of the socket

Sometimes alignment changes yield no noticeable pressure change in these areas. This can be due to loose M/L:

- Heat and reduce M/L
- Pad M/L
- Reduce M/L measurement on mold

High pressures medial-proximal / lateral-distal on a below-knee socket.

### Visual from INSIGHT App

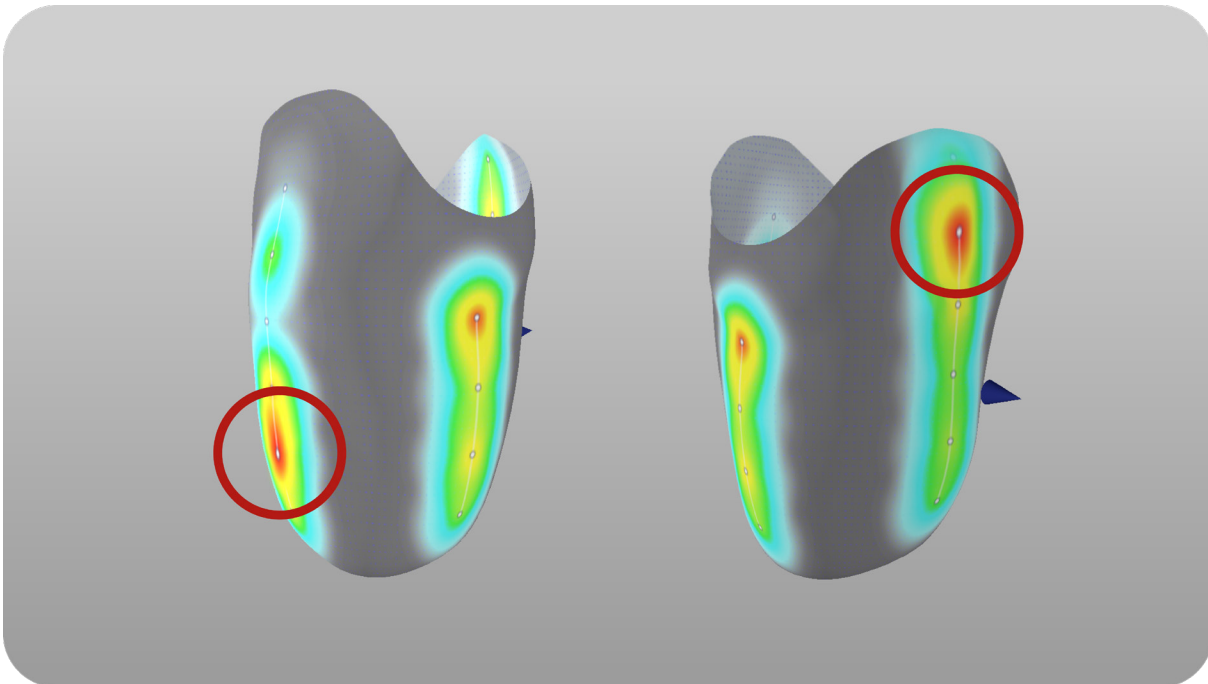


Figure 21: Example of high pressures medial-distal / lateral-proximal on a below-knee socket.

#### Potential mal-alignment associated:

- Excessive adduction of the socket
- Socket too inset

#### This type of visualization typically occurs when the weight line translates too far medial causing:

- Medial pylon lean
- Gap in the medial supracondylar area
- Excessive pressure at lateral proximal and medial distal areas.
- Wide base of gait

## Visuals

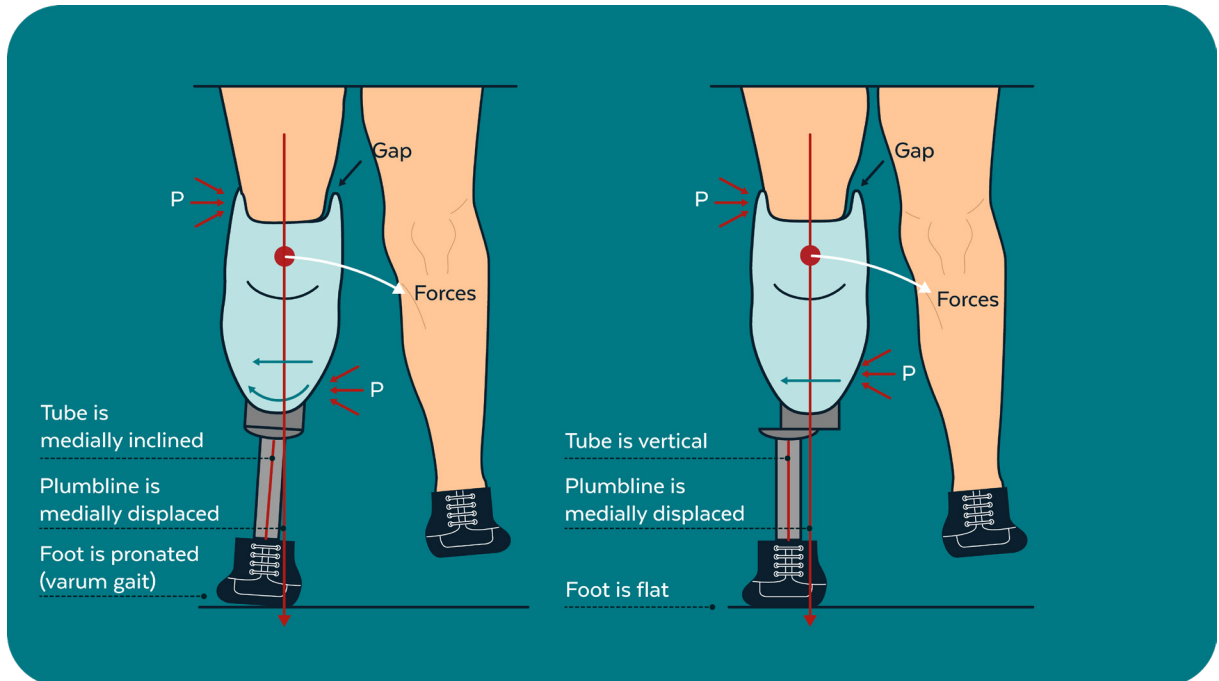


Figure 22: Example of gait deviation (anterior view) -High pressures medial-distal / lateral-distal or mix of both.

## Solutions

- Abduction of the socket
- Translate socket laterally

**Sometimes alignment changes yield no noticeable pressure change in these areas. This can be due to loose M/L:**

- Heat and reduce M/L
- Pad M/L
- Reduce M/L measurement on mold

## Terminal Stance

High pressures anterior-proximal / posterior-distal or mix of both  
Visuals from INSIGHT App

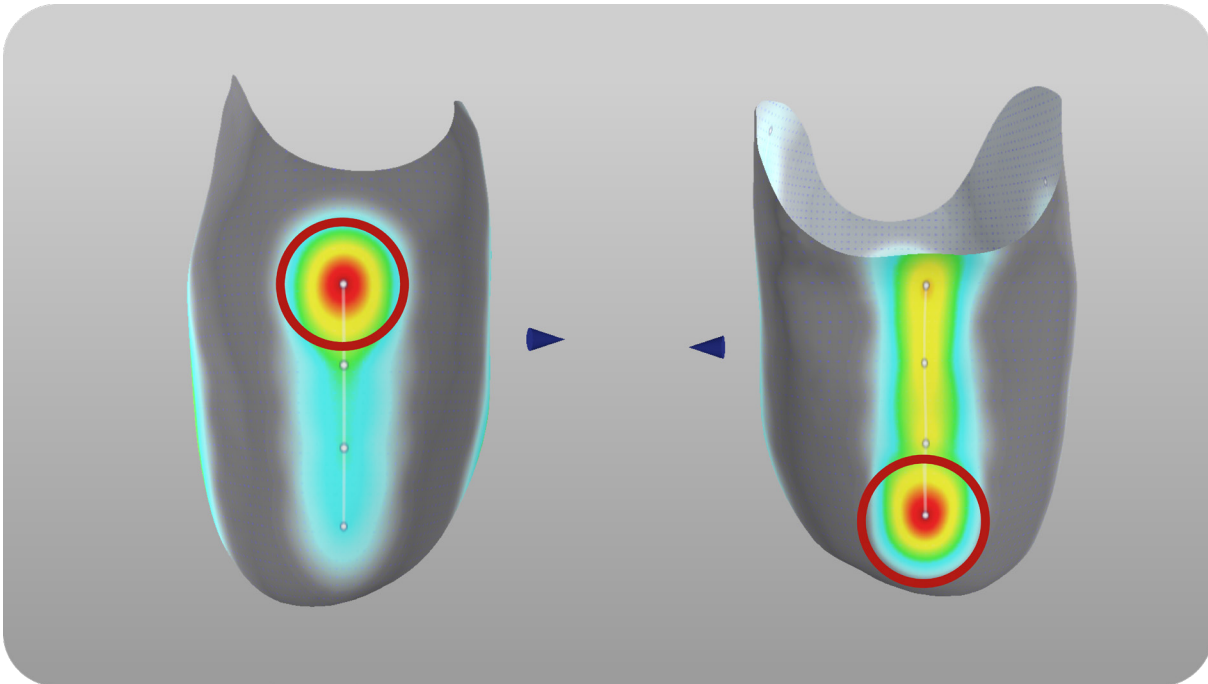


Figure 23: Example of high pressures anterior-proximal / posterior-distal on a below-knee socket.

### Potential mal-alignment associated:

- Insufficient socket flexion
- Socket translated too far posterior
- Reduced heel height

**This type of visualization typically occurs when the toe lever is too long causing:**

- Hyperextension of the knee
- Patellar pain
- Sensation of walking uphill (difficulty clearing the toe)
- Delayed heel rise



## Visuals

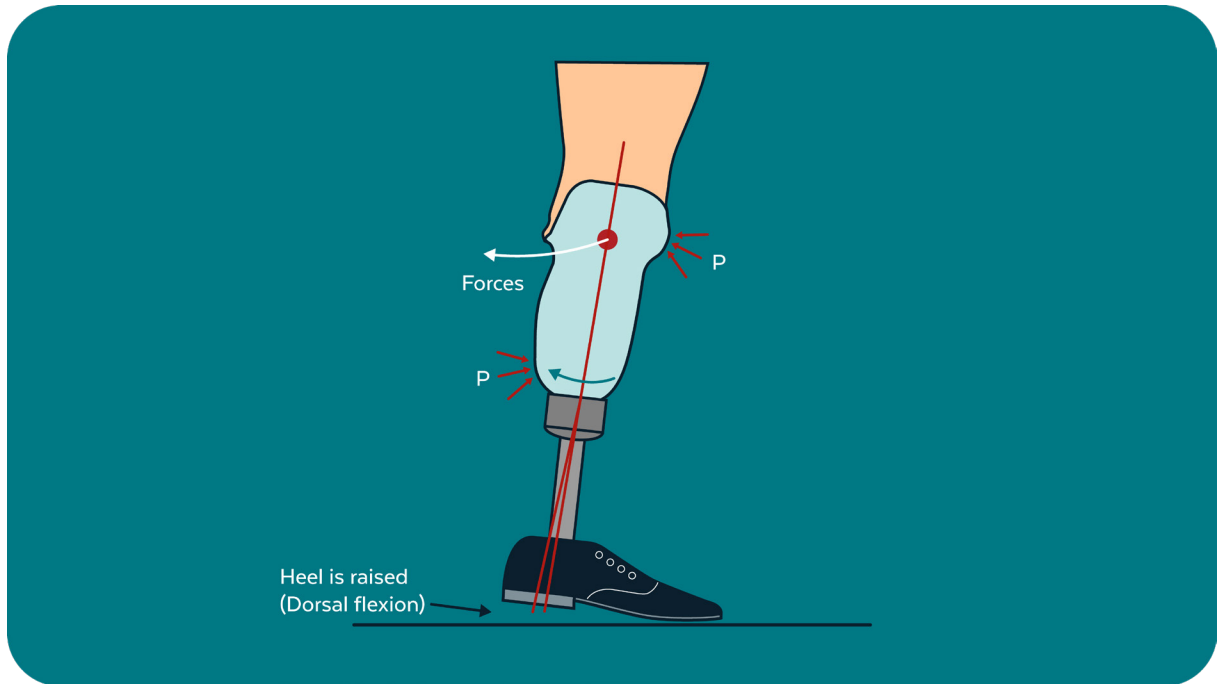


Figure 24: Example of gait deviation (lateral view) - High pressures anterior-proximal / posterior-lateral or mix of both.

## Solutions

- Flexion of the socket
- Anterior translation of the socket
- Change shoe

High pressures anterior-distal / posterior-proximal or mix of both.

## Visual from INSIGHT App

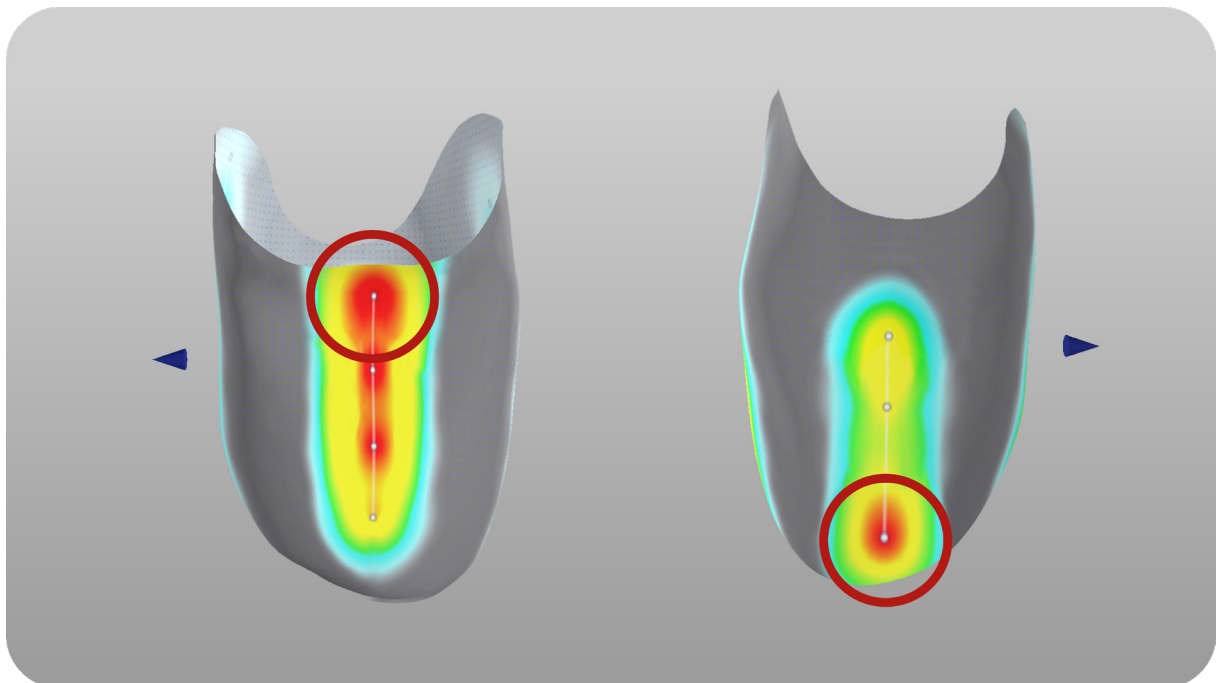


Figure 25: Example of high pressures anterior-distal / posterior-proximal on a below-knee socket.

### Potential mal-alignment associated:

- Excessive socket flexion
- Socket translated too far anterior
- Heel too high

### This type of visualization typically occurs when the toe lever is too long causing:

- Consistent knee flexion
- Early heel rise
- Drop off (sensation of walking downhill)

### Visuals

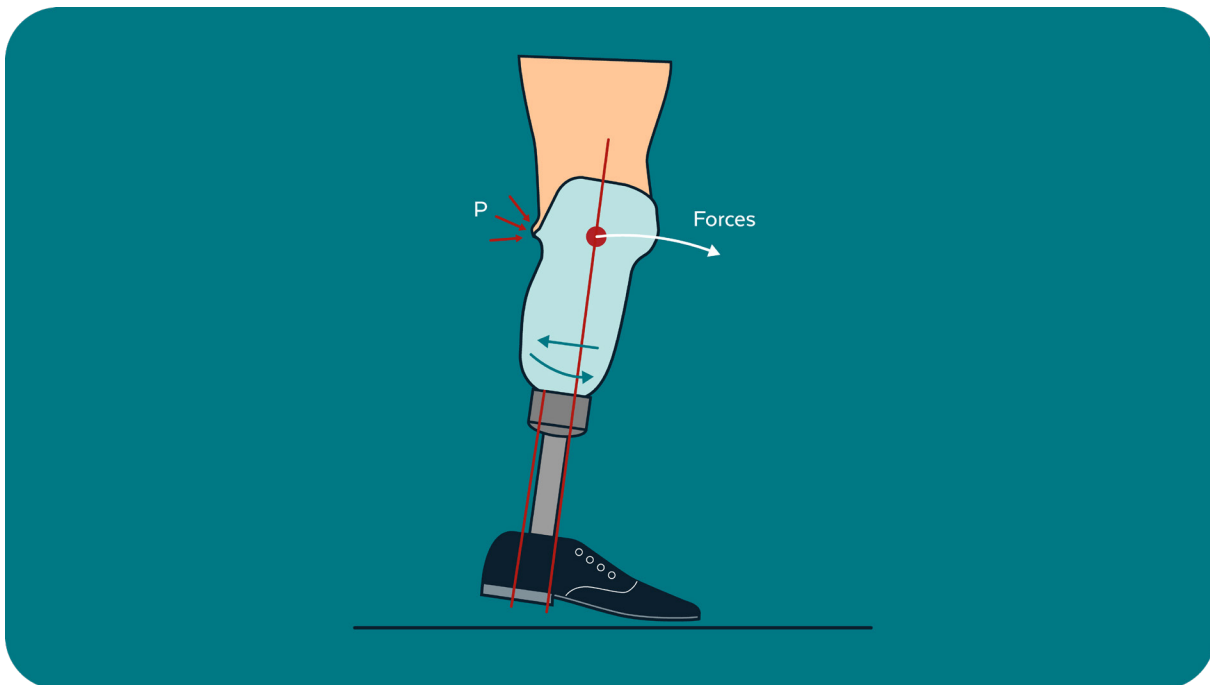


Figure 26: Example of gait deviation (lateral view) - High pressures posterior-proximal

### Solutions

- Extension of the socket
- Posterior translation of the socket
- Change shoe

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## CASE STUDIES

### Leslie D.

#### Summary

Historically, if Leslie walks for too long, the limb becomes uncomfortable along his plastic artery and swells up. He has to take his limb out of the socket and let it rest. This is very difficult to do with his work schedule.

*“Historically, if Leslie walks for too long, the limb becomes uncomfortable along his plastic artery and swells up. He has to take his limb out of the socket and let it rest. This is very difficult to do with his work schedule.”*

December 6th, 2019

#### Patient Profile

##### Age bracket

50 - 70

##### Amputation level

Left transtibial

##### Years using a prosthetic

24 years

##### Employment status

Employed (part-time)

#### Case profile

During amputation, a peripheral artery bypass surgery was performed to restore blood flow via a plastic tube. Excessive pressure on the lateral aspect of his residual limb – where the plastic tube is located – has caused discomfort over time.

His prosthetist has tried several different suspension styles over the years (anatomical suspension, suction, pin lock). Another solution involved making a channel in the socket to help relieve the plastic artery, however this would cause the socket to be looser due to the length of the plastic artery.

#### Insights

##### Problem

When Leslie removed his liner during his appointment, his limb was red and concerning. He was wearing a 3-ply sock fit and had only been wearing his prosthesis for 2 hours. His socket was scanned, and sensors were placed in areas of concern.



Figure 1: Leslie's residual limb.

### Assessment

Leslie was shown the pressure map of the socket during standing and walking exercises – his socket was noted to be loose fitting. He went from a 3-ply sock fit to a 5-ply sock fit. Data was further collected, and Leslie was shown the pressure map of his socket with a snugger fit.

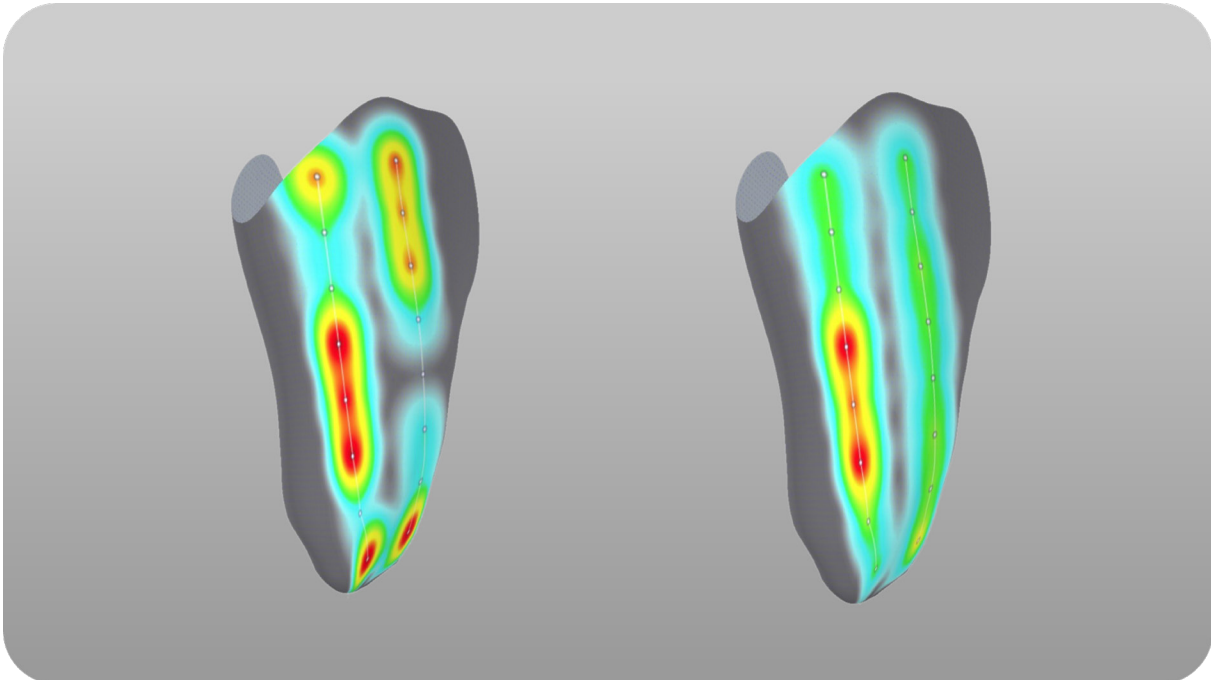


Figure 2: Leslie first dynamic acquisition with a 3-ply sock. Midstance (left) and Swing Phase (right).

He could clearly see pistoning within the socket when he did not have the proper socks on – higher pressure on the distal end. He could also see the lack of contact in the swing phase and high-pressure results for the bottom of his socket and limb during the stationary phase (Figure 2).

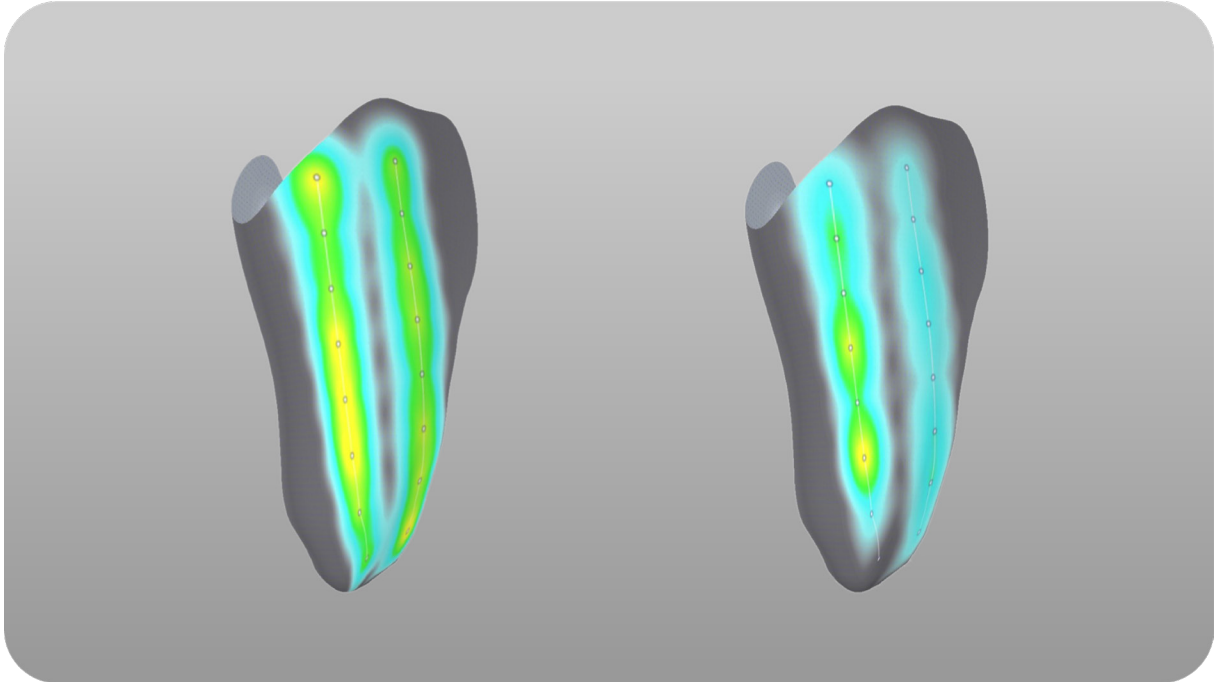


Figure 3: Leslie second dynamic acquisition with a 5-ply sock. Midstance (left) and Swing Phase (right).

When Leslie had the appropriate sock ply on, the plastic artery was located in the proper position and no longer caused unusual swelling or discomfort. He felt that he could walk for much longer (Figure 3). The loose fitting socket meant the plastic artery was receiving intermittent pressure, causing blood flow into the limb to be either completely free flowing, or if pressed upon blood flow stopped all together. This exchange from very high pressure on the artery to no pressure at all due to pistoning and movement within the socket meant Leslie had to take his socket off frequently throughout the day.

### Solution

INSIGHT System was great in helping to determine whether his plastic artery was being over or under-compressed. Pressure mapping indicated that there was inconsistent pressure in this area, and it was under-compressed.

Up to now, Leslie has been most comfortable using a 6-ply sock fit. When the prosthetist made a socket with a 0-3 ply fit, there was too much compression of the plastic artery throughout the day as his limb volume changed. If the offloaded channel was too big to account for this volume change, then the socket would significantly rotate. Leslie did not want to use suspension sleeves to help with this rotation, as the bunching behind the knee limited his range of motion.

*“You can explain sock ply management all day long and explain the problems associated with improper volume management, but even when someone has used a prosthesis for the past 20 years, sometimes this is not always managed correctly.”*



Figure 4: Leslie's prosthetist educating him using INSIGHT System.

### Benefits

Although Leslie has been a prosthetic user for over 20 years, he was not managing his sock ply correctly. This was not only causing limb discomfort, but also impacting the function of his plastic artery. By using the INSIGHT System, Leslie was able to see and better understand pistoning, sock ply management, and contact within the socket. It gave him a better understanding of his prosthetic care, and he was excited to finally see what he has been feeling.



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*“Wow. In all these years, I’ve never been able to see what’s going on with my leg. It’s great because you can see what I feel. I can actually see why my leg was turning red.”*

*Patient*

*“By showing Leslie the areas of high pressure and the corresponding redness on his limb and sock ply fit, he was able to clearly see the impact of adding a sock. His success is going to be much greater now that he has seen a precise visual of his limb and how his decisions impact his health. We also confirmed that the area of the plastic artery was actually being under-compressed due to the loose fit. Now with the proper sock ply, the plastic artery is receiving consistent pressure, making Leslie much more comfortable in his prosthesis.”*

*Prosthetist*





**Patient Profile****Age bracket**

60 - 80

**Amputation level**

Left transfemoral

**Years using a prosthetic**

2 years

**Employment status**Retired  
(but enjoys providing  
childcare for her  
grandchildren)

## Patricia F.

### Summary

Pat has been a prosthetic user for two years, however, has experienced anterior distal femur pain since her amputation. Previous solutions include modifications such as reliefs built into the socket and holes drilled into the rigid frame on a trial-and-error basis. Additionally, after experiencing collapsing arteries, Pat had surgery two weeks prior to INSIGHT testing to put a stent in place. Although the physician cleared her for prosthetic use one week later, there were still concerns about putting pressure on the stent.

*“Although her physician cleared her for prosthetic use one week after the surgery, Pat had concerns about the pressure the prosthesis places on her new stent.”*

### Case profile

Pat has had anterior distal femur pain present since amputation which was present both when she was and wasn't wearing her prosthetic. She also had a stent placement two weeks prior to INSIGHT System testing as she had been experiencing collapsing arteries. Previously, as an attempt at resolving her prosthesis-related pain, reliefs have been built into the socket during modifications. Additional holes in the rigid frame were cut, and reliefs were made into the inner flexible tube.

Before using INSIGHT System, the prosthetist would have to guess on location and estimate how much relief they were putting in. Pat would then have to leave to trial the new socket and see if any irritations arose, then return to the clinic at a later date to highlight any concerns.



Figure 7: Patricia walking during a dynamic acquisition with INSIGHT System.

## Insights

### Problem

Since amputation, Pat has experienced pain on the anterior distal aspect of the femur. This pain is present both with and without having her prosthesis on.

### Assessment

By using INSIGHT System, the prosthetist was able to see that Pat had too much anterior-posterior movement within her socket due to the relief that was made to accommodate the sensitive distal femur.

Pat has also been experiencing collapsing arteries and recently had a stent put into her femoral artery. The physician cleared her for prosthetic use about one week later however, wanted to make sure there were no additional pressures along the location of her stent.

### Solution

Additional relief placed in this area would have just made it worse, so the prosthetist added a pad superior to the sensitive distal femur to stabilize the bone while keeping the relief in this area. The INSIGHT System displayed significantly less motion and less pressure on the sensitive distal end.

### Benefits

By using INSIGHT System, the prosthetist was able to lay pressure indicators directly on the socket where Pat's stent is located. The pressure map showed precisely where to alleviate pressure and helped to determine how much the prosthetist offloaded this region. This allowed the prosthetist to accurately offload the specific area where the stent was located, while maintaining a snug fit and without sacrificing brim shape or ischial containment.



Figure 8: Patricia's prosthetist using INSIGHT System.

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*“I feel confident that my prosthetic leg is going to only keep helping me. I am glad I was able to see what was going on as I am very worried about my blood flow and the stent that’s in my leg. This made me feel much better about using my prosthesis again and I know there’s not too much pressure on the stent.”*

*Patient*

*“INSIGHT System has drastically aided my ability to make proper reliefs on a the brim without sacrificing the ideal fit. It helped me feel more confident, especially in an area that recently had a medical procedure. While using the INSIGHT System, I also ensured I had optimal ischial containment. I noticed while using the INSIGHT System that Pat had intermittent pressure, causing inconsistent ischial containment, so I was able to adjust the angle of the ischial seat for optimal containment, which helped to also improve overall comfort.”*

*Prosthetist*



## Erie V.

December 14th, 2020

### Patient Profile

**Age bracket**  
50 - 70

**Amputation level**  
Long-length  
right transfemoral

**Years using a prosthetic**  
4 years

**Employment status**  
Retired  
Lives independently

### Summary

Erie had been unable to use his previous prosthetic socket due to significant weight loss. A socket replacement was made so that Erie was more comfortable being active again – and insight was used to improve the fit.

### Case profile

Erie had a long-length right transfemoral amputation due to vascular complications. He had a lanyard suspension socket, however had been unable to use his previous prosthetic socket due to significant weight loss. A socket replacement was made to allow him to become more active again, and INSIGHT was used for optimum fit.

### Commercial metrics

Erie's overall satisfaction score prior to the adjustments was 84% using the McGann Feedback Form. After adjustments, Erie's score increased to 96%.



Figure 13: Erie's prosthetist using INSIGHT System.

## Insights

### **Problem**

After receiving his socket replacement, Erie returned one month later to report feeling less secure in his prosthesis since receiving it. He had lost an additional 12 pounds (~5 kg) from being more active. Erie had been using a 5-ply sock to support the volume loss, however still felt that he did not have good control of the prosthesis.

### **Assessment**

Erie kept the 5-ply sock on that he wore to the clinic and INSIGHT System was used to determine if he was using the correct socks. The INSIGHT System demonstrated optimal pressure with an even distribution along the brim of the socket. There was optimal contact where his pelvis sat in the socket, and this remained consistent throughout each phase of gait. This showed that the brim fit optimally with the 5-ply sock on.

Although the brim appeared to fit optimally, there was very little contact on the shaft of the femur or distal end of the socket. While ambulating, the slight pressures alternated from the anterior to posterior aspect of the socket. This demonstrated gaps within the socket between Erie's limb and the socket wall. He was moving within the socket, even though the brim was a proper fit.

An additional 3-ply sock was added – INSIGHT showed increased pressure along the brim and Erie reported discomfort. This proved that he already had the correct sock ply that he could tolerate. He was unable to tighten up his socket enough with socks.

The prosthetist added 1/8" medial, lateral, anterior, and posterior padding to provide control within the socket and all socks were removed. This made the socket slightly too tight on the distal end. Erie was able to feel this, and INSIGHT provided clinical verification of pressure points.

### Solution

The prosthetist removed the posterior 1/8" pad, and Erie wore a 1-ply sock. This resulted in the evenest pressure distribution within the socket, including the brim and all four walls of the socket. Having a 1-ply sock fit maintained tightness along the brim, and the padding allowed for optimal tightening of the socket walls. This fit was confirmed by the INSIGHT System.

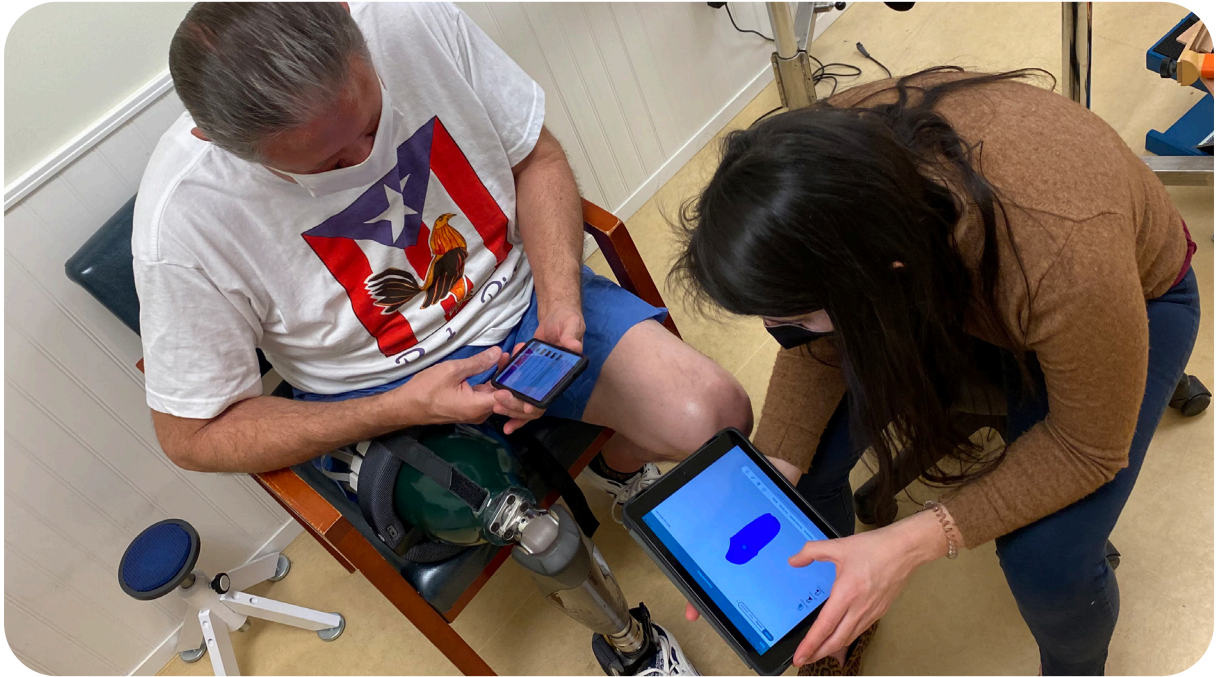


Figure 14: Erie's prosthetist using INSIGHT System.

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*“Using INSIGHT System confirmed these changes were most conducive to maintaining the optimal fit. Erie has a history of becoming easily discouraged with his prosthetic care due to frequent volume changes. The INSIGHT system helped him take part in his care and visually reference to what he was feeling and experiencing in his socket.”*

*Prosthetist*



October 20th, 2020,  
and February 8th, 2021

**Patient Profile**

**Age bracket**  
65

**Amputation level**  
Right transtibial

**Years using a prosthetic**  
3 years

**Employment status**  
Employed (part-time)

## Kris S.

### Summary

Kris was successfully fit with an adjustable RevoFit prosthetic socket as her distal end needed stability and control. She also experienced was experiencing significant volume changes throughout the day and needed adjustability.

### Case profile

Kris experienced an amputation due to a failed knee replacement. She presents with a 2” tibial length followed by 4” of excess tissue at the end of her limb. She has experienced significant difficulties with control within her socket due to the excess tissue causing movement. She also has a history of a lack of sensation in her residual limb.

### Commercial metrics

Kris’ previous prosthesis was made using traditional methods. It took 15 visits in total, including all follow-up appointments within two months after receiving the prosthesis.

Kris’ current prosthesis made using INSIGHT has reduced the total number of appointments to nine visits.



Figure 15: Kris's current prosthetic socket.

## Insights

### Problem

Kris was in the process of receiving a socket replacement due to volume changes. Her situation provided an opportunity to test the INSIGHT System on a diagnostic socket and integrated RevoFit BOA system. The purpose of using INSIGHT to assist with her fitting was to ensure that she was getting equal pressure from the socket panels distributed across the limb.

### Assessment

Sensors were placed along the two anterior pretibial panels and another on the posterior calf panel. An additional sensor was placed between the two pretibial panels to assess pressure on the short, sensitive tibia. The INSIGHT System helped to assist with the fitting and location of the panel placement, to ensure it was optimal for final fabrication.

The first pressure analysis demonstrated that the medial pretibial pad was located too far back on the socket and was therefore pushing too much onto the medial border of the tibia. The patient was unable to feel this due to excessive redundant tissue and lack of sensation.



Figure 16: Static acquisition being performed using INSIGHT System.

### Solution

Before moving to the final socket, the prosthetist adjusted the medial pretibial pad to the correct location.

After this panel was adjusted, another pressure reading was performed. This showed that the posterior panel was not sitting flush on the gastrocnemius muscle, and the pads needed to be contoured.

The fiberglass wrap around the socket obstructs the view of the adjustable panels, so clinicians cannot tell whether smooth total contact is achieved – this is where INSIGHT brings added value. The pad was adjusted on the posterior aspect and found to be optimal for the contour of her limb.

### Benefits

If this had not been addressed using INSIGHT, eventually it would have led to significant skin breakdown and irritations with the definitive socket.

This would also have cost the clinic additional time and resources to fabricate a new socket.

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*“The process was much smoother this time around. During previous appointments, we had to take my prosthesis and liner on and off multiple times to inspect my skin frequently under the adjustable socket system.”*

*Patient*

*“The INSIGHT System provided me with the information to understand that modifications to the prosthesis were clearly necessary before going into final fabrication. The RevoFit adjustable sockets are a great option for patients, however they are a challenge to fit diagnostically. This is due to the fiberglass needed to hold the RevoFit BOA system in place. With INSIGHT, I was able to assess these systems with much greater success.”*

*Prosthetist*



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[www.adapttech.eu](http://www.adapttech.eu)  
[info@adapttech.eu](mailto:info@adapttech.eu)  
+44 121 371 8196

HQ  
156 Great Charles St  
Queensway  
Birmingham B3 3HN  
United Kingdom

R&D AND PRODUCTION  
Rua Oliveira Monteiro 649  
4050-445, Porto  
Portugal

US OFFICE  
1800 N Greene St, Ste E  
Greenville, NC 27834  
United States