

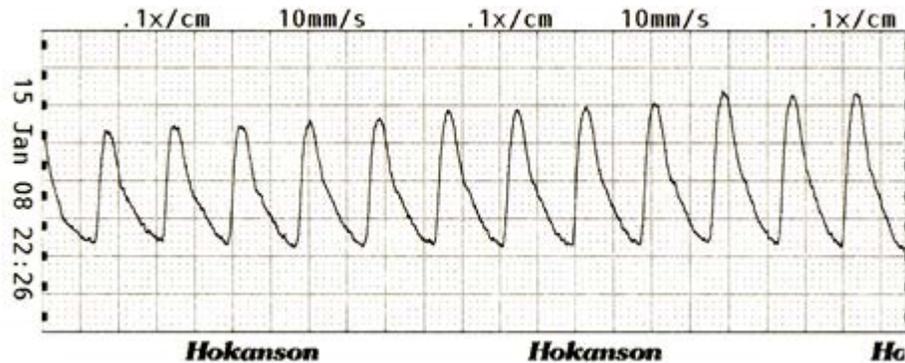
## Toe / Brachial Index

- Description** A Toe Brachial Index or TBI is performed when the ABI or Ankle Brachial Index is abnormally high due to calcification of the arteries in the leg; the calcification renders the arteries incompressible, making accurate blood pressure measurements difficult to obtain. The calcification of the ankle arteries is most often found in diabetic patients. The abnormally high ABI is  $>1.3$ .
- Equipment** The systolic pressure in the toe is most commonly obtained with a photo plethysmograph used as the arterial pulse detector. A toe blood pressure cuff and sphygmomanometer are also required. The Hokanson Toe Pressure Kit includes the instruments and accessories needed: MD6RP Photo Plethysmograph and photo transducer with the MD6VR Chart Recorder, UPC 2.5<sup>TM</sup> toe cuffs, and DS400 Aneroid Sphygmomanometer.
- The arm and ankle systolic pressures for the Ankle / Brachial Index should be measured with a Doppler and vascular cuffs. Please see the Ankle / Brachial Index application note for the equipment and procedure.
- Preparation** The patient should be in a warm comfortable room, supine with arms and legs at heart level. Keep feet warm with a blanket or towel if needed.
- Procedure** Select the appropriate sized cuff for each limb. You will need one cuff for each upper arm and for each large toe. Measure the cuff width to the diameter of the limb; the cuff width should be 20% larger than the limb diameter to compress all of the soft tissue evenly. The cuff should be put on straight and fit snugly but not tight. You must use vascular cuffs which have long bladders to completely encircle the limb and compress all of the soft tissue. The toe cuff should be wide enough to apply pressure over a large enough area so as to not be a tourniquet and long enough to overlap the bladder lengthwise.
- Put the cuffs on the arms and toes once the patient is supine. Have the sphygmomanometer, patient chart, etc. in the room ready to use. The rest period should be at least 10 minutes with 15-20 ideal. The goal is for the patient to relax. This time can be used for interviewing the patient, listening to the heart, palpating the abdomen, checking the neurological reflexes and sensation in the feet.



After the rest period, take the first brachial pressure. The brachial pressure is typically taken using a Doppler, as described in the **Hokanson Ankle / Brachial Index** application note. After you have taken the brachial systolic blood pressures, proceed to the toe pressures.

Check that the toe cuff is well placed. Put the PPG (photo transducer) on the pad of the large toe so it is not touching the cuffs. Make sure the Velcro will hold the PPG in place but not compress the blood vessels by being too tight. You should see the patient's pulse as a waveform on the chart recorder.



Connect the sphygmomanometer to the toe pressure cuff and inflate slowly until you see the waveform disappear. Note the pressure and continue to inflate until 20-30 mmHg above that pressure (super systolic). Now slowly release the pressure in the cuff at about 2 mmHg per second until the waveform reappears. The pressure in the cuff at the time the first pulsation returns is the systolic blood pressure. Observe that pressure on the sphygmomanometer and make a note of it. Deflate the cuff completely.

Repeat the toe pressure on the other side.

**Interpretation** Calculate the Toe Brachial Index (TBI) by dividing the highest toe pressure by the highest brachial pressure.

$$\text{Highest Toe Pressure} / \text{Highest Brachial} = \text{Index (TBI)}$$

A TBI value of 0.70 or greater is considered normal. If the TBI is below 0.70 there is reduced blood flow to the small vessels in the big toe. Values less than 0.70 are abnormal, with increasing severity as the index gets smaller.

A normal TBI differs from a normal ABI because the normal blood pressure in the big toe (hallux) is expected to be less than at the ankle or the arm.

**References** Zierler R. E., Strandness's Duplex Scanning in Vascular Disorders, Fourth Edition; Lippincott Williams & Wilkins, Philadelphia, PA, 2010.  
Norgren L, Hiatt WR, Dormandy JA, et al. Inter-Society Consensus for the Management of Peripheral Arterial Disease (TASC II). Eur J Vasc Endovasc Surg. 2007;33 (suppl 1):S1-S70.