

- B. Cold may cause long distal latencies with normal amplitudes.
- VIII. Normal Values (12, 48)
- A: Amplitude range is from 12 to 25 μ v.
- B. Maximal peak latency is 2.2 msec.

LOWER EXTREMITY STUDIES

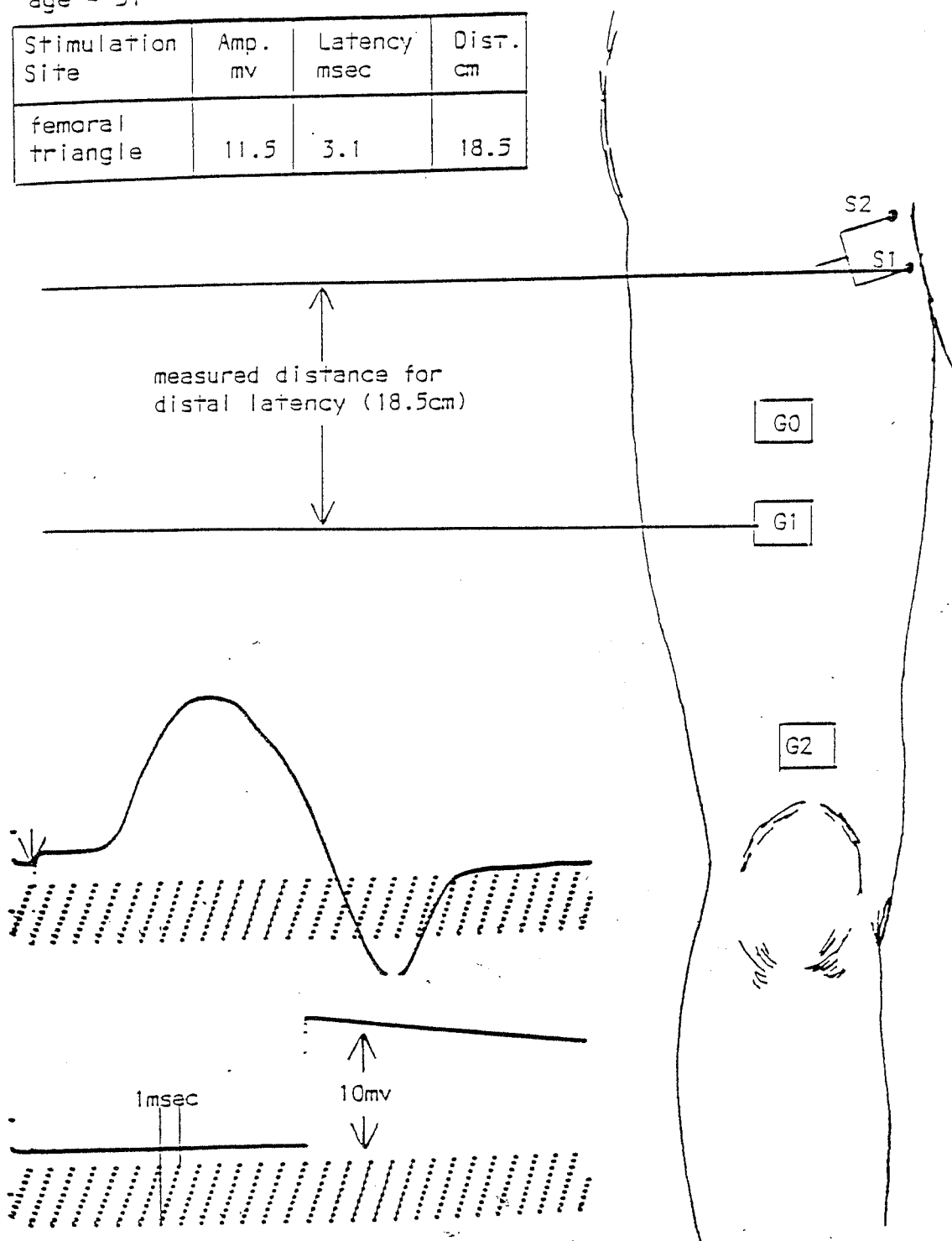
Femoral (motor)/rectus femoris (10, 48, 50)

- I. Position of Patient
- A. Patient is supine with lower extremity extended.
- B. Lower extremity is supported by bed at all times.
- II. Equipment
- A. 2 large disc electrodes or small grounds (G1 active, G2 reference)
- B. 1 ground (G0)
- C. 1 bipolar stimulator (S1 cathode, S2 anode)
- III. Machine Settings
- A. Sweep speed (ms/div)—2 to 5
- B. Gain (mv)—1 to 10
- C. Filters—1.6(Hz), 8(KHz)
- IV. Electrode Placement
- A. G0 (ground)—over anterior portion of the thigh between G1 and S1.
- B. G1 (active)—over the belly of the muscle rectus femoris.
- C. G2 (reference)—anterior portion of the thigh 3 to 5 cm proximal to the knee.
- V. Stimulation Sites and Measurements
1. Stimulate—S1, in the femoral triangle just lateral to the pulse of the femoral artery with S2 angled proximal. Single prong stimulator may be used with S1 positioned as above and S2 on the lateral portion of the thigh in line with S1.
2. Measure—distance from S1 to G1 in a straight line.
- VI. Calculations
- A. Distal Latency—Calculate from shock artifact to the takeoff of the negative deflection.
- B. Amplitude—Calculate from baseline to the peak of the negative deflection.
- VII. Variations and Pitfalls
- A. Amplitude and configuration of response may vary depending on the placement of G1.
- VIII. Normal Values
- A. Both the distal latency and the amplitude are based on a side-to-side comparison.
- B. Careful measurements should be made to insure accurate comparison from side to side.

FEMORAL (motor) / rectus femoris

age = 31

Stimulation Site	Amp. mv	Latency msec	Dist. cm
femoral triangle	11.5	3.1	18.5

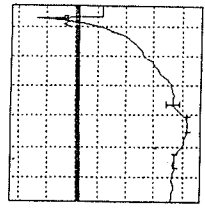


Peroneal (motor)/extensor digitorum brevis (10, 48, 45)

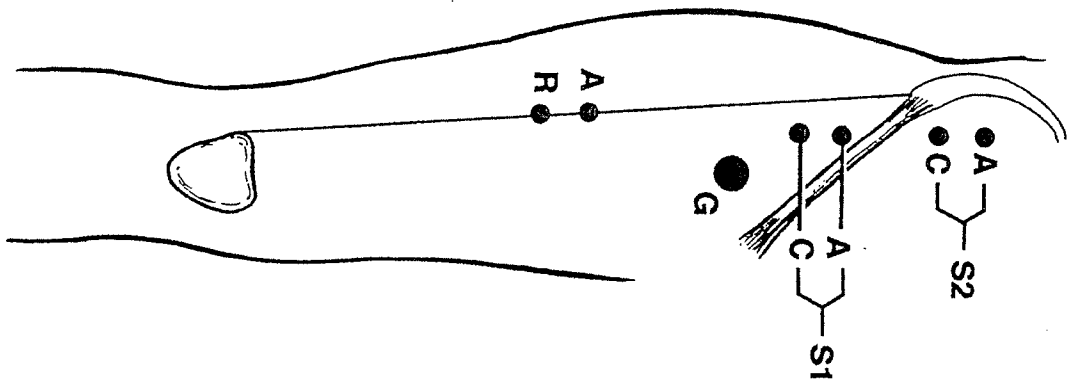
- I. Position of Patient
 - A. Patient is supine with lower extremity extended.
 - B. Lower extremity is supported by the bed at all times.
- II. Equipment
 - A. 2 disc electrodes (G1 active, G2 reference)
 - B. 1 ground (G0)
 - C. 1 bipolar stimulator (S1 cathode, S2 anode)
- III. Machine Settings
 - A. Sweep speed (ms/div)—2 to 5
 - B. Gain (mv)—1 to 10
 - C. Filters—1.6(Hz), 8(KHz)
- IV. Electrode Placement
 - A. G0 (ground)—dorsum of the foot between G1 and distal S1.
 - B. G1 (active)—over the belly of the muscle extensor digitorum brevis.
 - C. G2 (reference)—approximately 3 cm proximal to the fifth toe on the dorsum of the foot.
- V. Stimulation Sites and Measurements
 - A. Ankle (distal):
 1. Stimulate—S1, anterior portion of ankle between the tibialis anterior tendon and the extensor hallucis longus tendon, 3 to 5 cm proximal to the inferior retinaculum of the extensor muscles.
 2. Measure—distance from S1 to G1 in a straight line. On adults use distance between 5 and 9 cm.
 - B. Knee:
 1. Stimulate—S1, lateral portion of the popliteal fossa, medial to the biceps femoris tendon, and proximal to the head of the fibula.
 2. Measure—distance from knee-S1 to ankle-S1 following the contour of the leg along the course of the deep branch of the peroneal nerve.
 - C. Fibular Head:
 1. Stimulate—S1, below the head of the fibula at least 10 cm from the knee-S1.
 2. Measure—distance from fibular head-S1 to ankle-S1 following the contour of the leg along the course of the deep branch of the peroneal nerve.
- VI. Calculations
 - A. Distal Latency—Calculate from the shock artifact to the takeoff of the negative deflection of the distal response.

LATERAL FEMORAL CUTANEOUS SENSORY NERVE

Lower Limb Sensory and Mixed Nerve Studies



Typical waveform appearance



Electrode Placement—Ma and Liveson Technique

Ma and Liveson Technique

Position: This study is performed in the supine position.

Recording electrodes: Surface electrodes are placed along a line connecting the anterior superior iliac spine (ASIS) to the lateral border of the patella with the active electrode (A) 17–20 cm distal to the A reference electrode (R) 3 cm more distal.

Ground electrode (G): Placement is between the stimulator and recording electrodes.

Stimulation point 1 (S1): Stimulation can be applied between the inguinal ligament over the origin of the sartorius.

Stimulation point 2 (S2): Stimulation can be applied about 1 cm medial to the ASIS.

Machine settings: Standard sensory settings are used.

Nerve fibers tested: L2 and L3 nerve roots through the posterior horn of the lumbosacral plexus.

Normal values (1) (20 subjects) (room temperature 23–26°Celsius):

Onset latency (msec)	Mean	S.D.	Range	Upper Limit of 1
S1 (14–18 cm)	2.5	0.2	2.2–2.8	2.9
S2 (17–20 cm)	2.8	0.4	2.3–3.2	3.6

Peak-to-peak amplitude (µV)	Mean	S.D.	Range
S1	7.0	1.8	4–11
S2	6.0	1.5	3–10

Helpful Hints

- This study is technically difficult, especially in overweight patients. Absent responses are of questionable clinical significance.
- For S2 stimulation it may help to rotate the anode medially toward the ASIS. Rotating the anode may be necessary to increase stimulus intensity.

Lateral Femoral Cutaneous Nerve Conduction

Patient Position: The patient may be positioned supine, with their legs extended.

Skin Prep: Wipe with alcohol, temperature check.

Settings: Sweep Speed: 1 ms/div.
Sensitivity/Gain: 10 μ V/div
Filters: 20 Hz – 2 KHz

Recording:

The surface electrodes are placed along a line connecting the anterior superior iliac spine to the lateral border of the patella.

Active: The active electrode is placed 15-20 cm distal to the anterior superior iliac spine.

Reference: The reference electrode is placed 3-4 cm distal to the active electrode.

Ground: The ground is placed in between the stimulating and recording.

Stimulation:

The nerve is stimulated antidromically above the inguinal ligament (S1) 1 cm medial to the anterior superior iliac spine, and/or below the inguinal ligament over the origin of sartorius muscle (S2) with the cathode located distally.

Key Points:

This is technically difficult test. The response may be difficult to obtain since it may be overlapped by shock artefact and a motor response from the quadriceps. The non-affected side should be tested first for detectable response. The patient may be able to detect successful stimulation of the nerve when a sensation is elicited radiating to the anterior thigh. Because of the technical difficulties of this test, especially in a heavy person, no conclusion should be drawn if no response can be elicited.

Author	Distal distance (cm)	Recording	Amplitude (μ V)	Peak Latency (ms)	Conduction Velocity (m/s)
Shapiro	12	Anterior thigh	≥ 4	≤ 2.6	-

Lateral Femoral Cutaneous Nerve of Thigh Conduction
 (Testing: L2-L4 Roots, Lumbar Plexus, Lateral Femoral Cutaneous Nerve)

