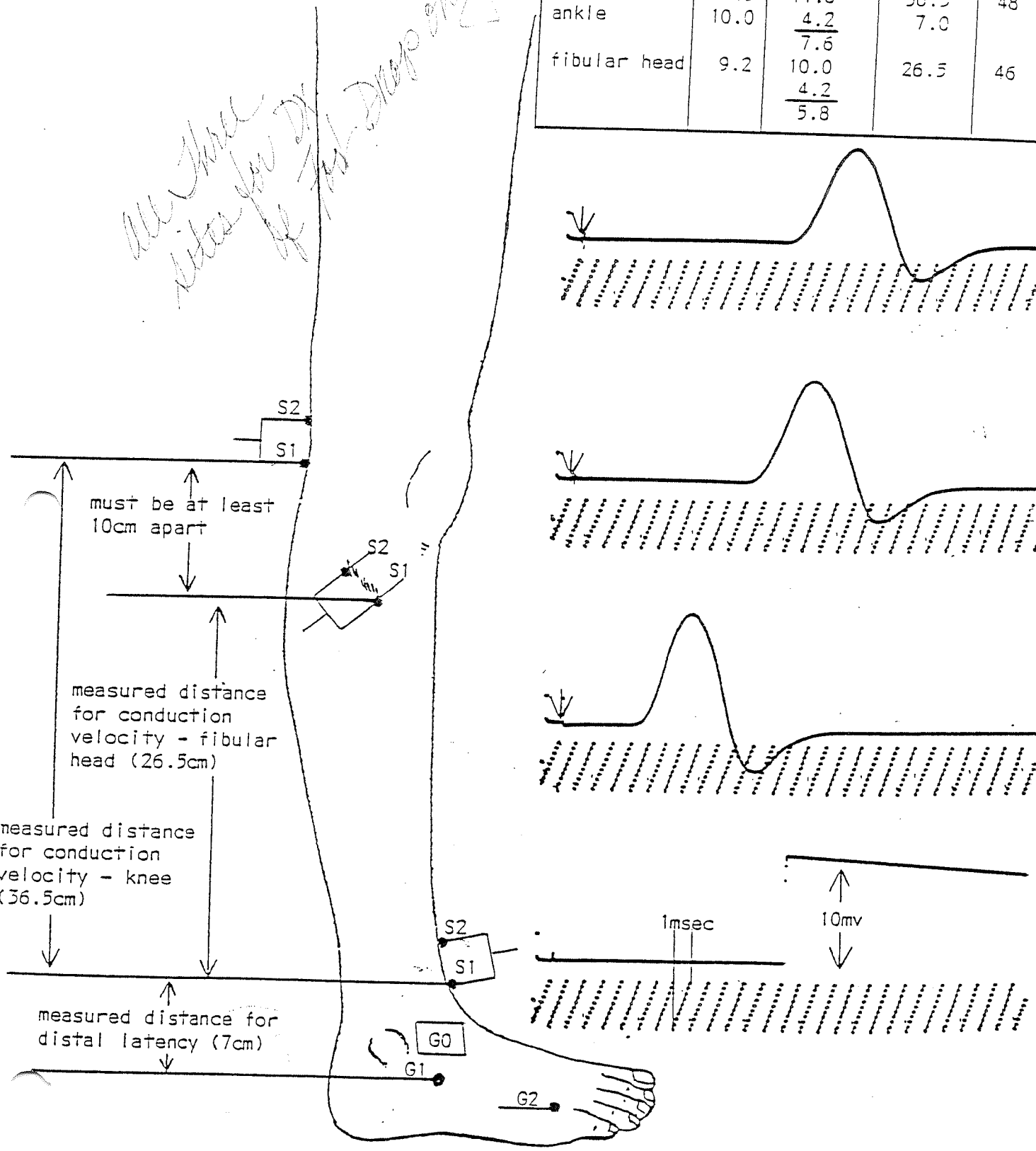
PERONEAL (motor) / extensor digitorum brevis

age = 37

Stimulation Site	Amp. mv	Latency msec	Dist. cm	C.V. M/sec
knee	8.5	11.8	36.5	48
ankle	10.0	4.2	7.0	
		7.6		
fibular head	9.2	10.0	26.5	46
		4.2		
		5.8		



B. Amplitude—Calculate from baseline to the peak of the negative deflection.

C. Conduction Velocity—Using latencies measured to the takeoff, subtract the distal from the proximal latency, divide the difference into the distance between proximal-S1 and distal-S1, and multiply by 10.

VII. Variations and Pitfalls

A. Amplitude and configuration of response may vary depending on the placement of G1.

B. If amplitude at knee drops more than 2 mv from ankle, or if configuration changes between the two stimulation points:

1. Check for maximal stimulation at the knee.
2. Check if posterior tibial muscles in the foot are being stimulated at the ankle (dorsiflexion of the foot correct movement).

C. If amplitude at the knee is higher than amplitude at the ankle:

1. Check for maximal stimulation at the ankle.
2. Check if posterior tibial muscles in the foot are being stimulated at the knee.
3. Check for accessory peroneal nerve (see Chapter 5).

VIII. Normal Values (Cleveland Clinic Foundation EMG Laboratory)

AGE	AMPLITUDE mv	DISTAL LATENCY msec	CONDUCTION VELOCITY m/sec
0-9	2.5- 7 (4)	2.3-4.0 (2.9)	48-60 (53)
10-19	4-12 (8)	2.5-5.5 (4.1)	43-61 (50)
20-29	3-18 (8)	2.6-6.0 (4.1)	42-58 (50)
30-39	3-16 (8)	2.6-6.0 (4.1)	42-57 (49)
40-49	2.5-15 (8)	2.8-5.9 (4.1)	42-58 (49)
50-59	2.5-13 (6)	2.8-6.0 (4.1)	41-57 (48)
60-69	2.5-14 (6)	2.9-5.6 (4.1)	41-56 (46)
70-	2.5-14 (6)	2.8-5.4 (4.1)	41-52 (46)

Peroneal (motor)/tibialis anterior (10, 48, 50)

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 large disc or small ground 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

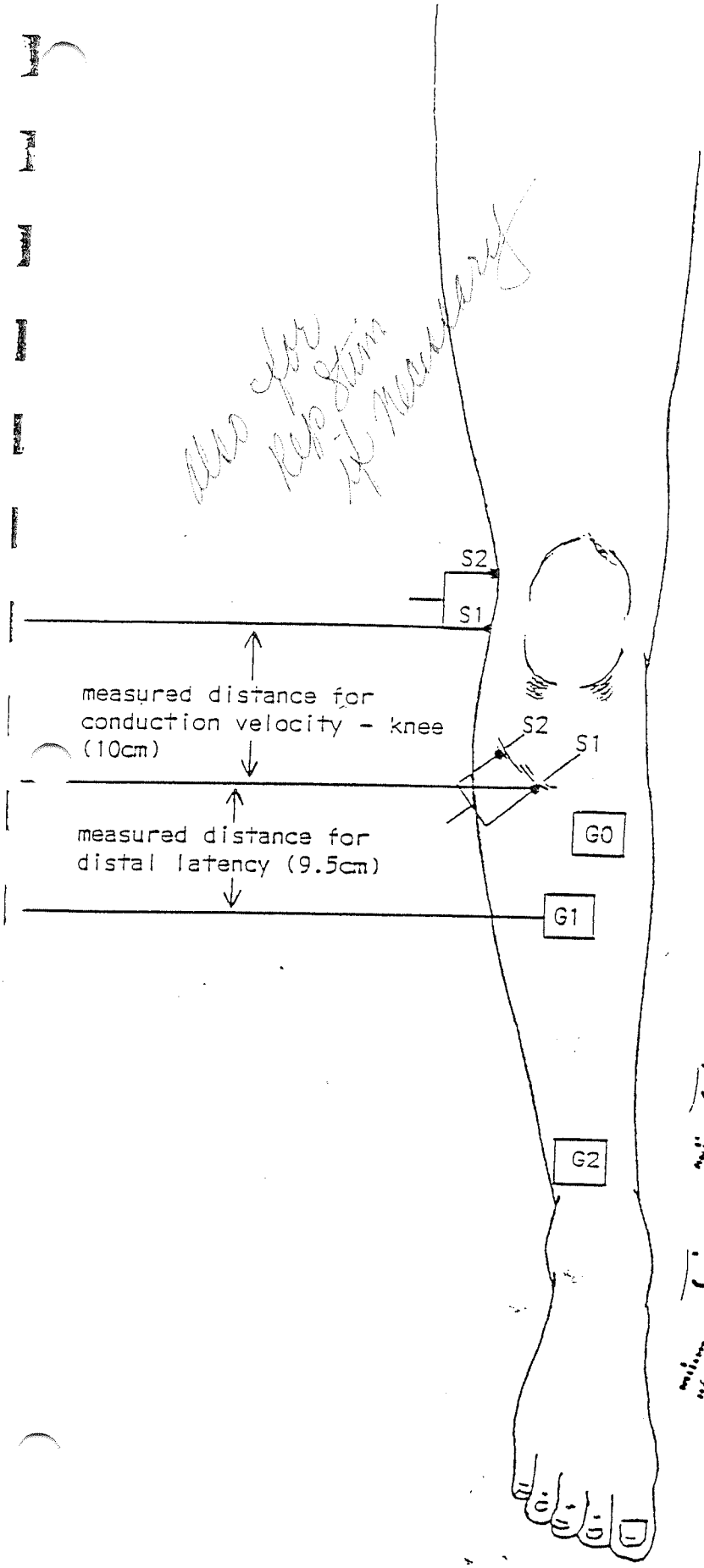
B. Gain (mv)—1 to 10

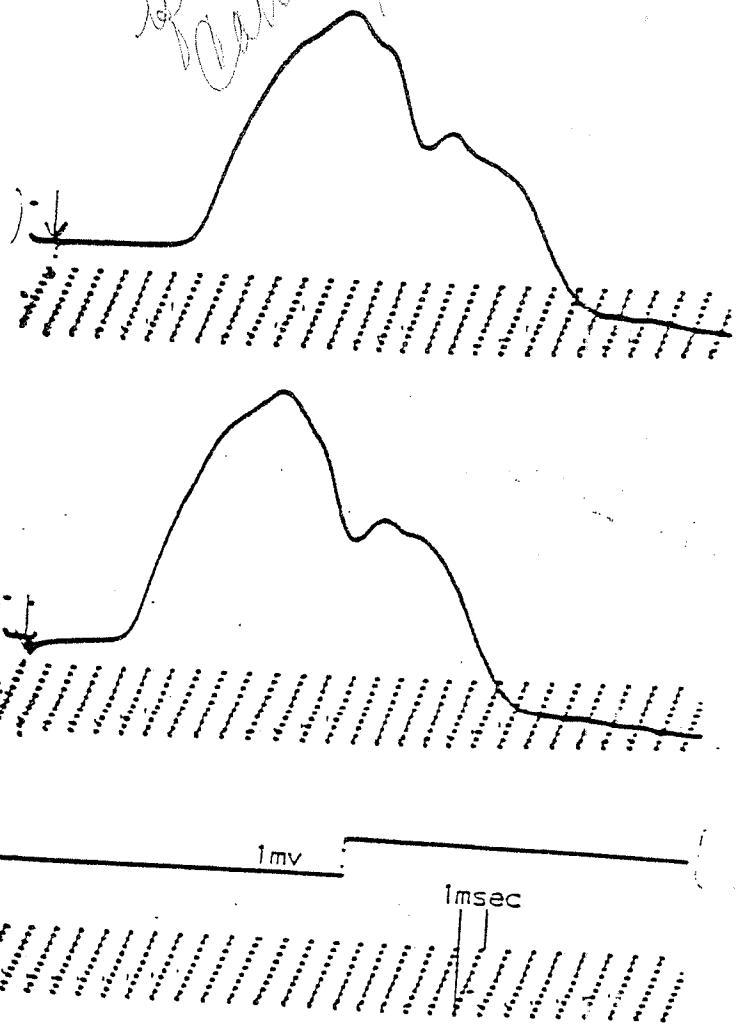
C. Filters—1.6(Hz), 8(KHz)

PERONEAL (motor) / tibialis anterior

age = 33

Stimulation Site	Amp. mv	Latency msec	Dis-. cm	C.V. M/sec
knee	6.0	5.2	10.0	63
fibular head	6.4	3.6	9.5	
		1.6		





IV. Electrode Placement
  A. G0 (ground)—between G1 and distal S1
  B. G1 (active)—over the belly of the muscle tibialis anterior just lateral to the tibia.
  C. G2 (reference)—approximately 10 cm proximal to the ankle just lateral to the tibia.

V. Stimulation Sites and Measurements
  A. Fibular Head (distal):
    1. Stimulate—S1, distal to the head of the fibula at least 10 cm from knee-S1.
    2. Measure—distance from S1 to G1 following the contour of the leg.
  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 fibular head-S1 following the contour of the leg.

VI. Calculations
  A. Distal Latency—Calculate from shock artifact to the takeoff of the negative deflection of the distal response.
  B. Amplitude—Calculate from baseline to the peak of the negative deflection.
  C. Conduction Velocity—Using latencies measured to the takeoff, subtract the distal from the proximal latency, divide the difference into the distance between proximal-S1 and distal-S1 (at least 10 cm) and multiply by 10.

VII. Variations and Pitfalls
  A. Amplitude and configuration of response may vary depending on the placement of G1.
  B. If amplitude varies more than 2 mv between stimulation sites:
    1. Check for maximal stimulation at both stimulation sites.
    2. Check for erroneous stimulation of the posterior tibial nerve (dorsiflexion of foot correct movement).
  C. If an increased stimulus artifact occurs with fibular head stimulation, move the ground (G0) closer to G1.
  D. Because of short distances, the conduction velocity will frequently be spuriously fast.

VIII. Normal Values
  A. The distal latency, amplitude, and conduction velocity are based on a side-to-side comparison.
  B. Careful measurements should be made to insure accurate comparison from side to side.

Peroneal, Superficial (sensory-antidromic)/dorsum of foot (28)

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)—1 to 2
   B. Gain (μv)—5 to 20
   C. Filters—32(Hz), 1.6(KHz)
IV. Electrode Placement
   A. G0 (ground)—lateral side of ankle just anterior to the lateral mallelous between G1 and S1.
   B. G1 (active)—directly over the nerve on the dorsum of the foot 6 to 10 cm from the web space of the fourth and fifth toes. (Palpate the nerve by plantar flexing and inverting the foot.)
   C. G2 (reference)—approximately 3 cm proximal to the web space of the fourth and fifth toes.
V. Stimulation Sites and Measurements
   A. Pt. A
      1. Stimulate—S1, 10 cm from G1 on the lateral side of the leg between the fibula and the achilles tendon (may be slightly more anterior), usually over the peroneus longus tendon.
      2. Measure—
         a. distance from S1 to G1 in a straight line. On adults use a distance of 10 cm.
         b. distance from G1 to the interdigital web space of the fourth and fifth toes. This measurement is taken to insure proper amplitude comparisons to the contralateral side and to future studies on the ipsilateral side.
VI. Calculations
   A. Distal Latency—Calculate from the shock artifact to the peak of the negative deflection of the response.
   B. Amplitude—Calculate from baseline to the peak of the negative deflection.
VII. Variations and Pitfalls
   A. At least 5 percent of "normal" persons have no detectable response (so far always bilaterally)
      ±½ due to nerve absence
      ±½ due to nerve "inexcitability"

SUPERFICIAL (sensory-antidromic) / dorsum of foot
PERONEAL

Figure 6-15
Sensory nerve conduction study of the superficial peroneal nerve. The nerve is stimulated [illegible] the anterior [illegible] of the fibula, 12 cm from the active electrode (G1), located just medial to the lateral malleolus at the ankle. Reference electrode (G2) is placed 2-3 cm distal.

Sural nerve

The sural nerve [illegible] derived from the S-1 root via the medial sural branch of the [illegible] nerve [illegible] in the popliteal fossa. It becomes superficial at the junction of [illegible] the leg, at which point it receives a sural communicating branch of the common peroneal nerve. In some cases, the communicating branch is [illegible] than the main trunk of the sural nerve. The nerve continues to descend toward the [illegible] along the inferior aspect of the lateral malleolus. Its terminal branch is the lateral dorsal cutaneous nerve, which supplies the lateral aspect of the dorsum of the foot. As discussed in Chapter 4, the sural nerve may be biopsied for in vitro conduction studies and histologic assessments. The findings may then be directly correlated with the results of in vivo studies.

Sensory conduction of the sural nerve may be studied readily without resorting to an averaging device. In this method, antidromic sensory potentials are recorded using surface electrodes placed on the nerve as it passes around the lateral malleolus (Figs. 6-15 and 6-17). The nerve is stimulated in the lower third of the leg, with surface electrodes placed over the posterior aspect slightly lateral to the midline. It is also possible to stimulate the nerve at three points, dividing the sural nerve into three contiguous nerve segments of 7 cm each. When this is done the mean velocity is significantly smaller in the most distal segment than in the middle or proximal segment, with no difference between the middle and proximal segments.

In vivo measurement of orthodromic sural nerve action potentials has also been described using electronic averaging. By this means, sensory potentials are recorded at the popliteal fossa and high at the ankle, 10 to 15 cm proximal to the lateral malleolus, following stimulation of the nerve over the lateral aspect of the foot. This allows comparison between distal and proximal segments of the nerve (Table 6-13). Sural nerve conduction is considered one of the most frequently abnormal electrophysiologic parameters in neuropathies of various etiologies. Studies of this nerve are helpful in distinguishing peripheral lesions from S-1 or S-2 radiculopathy [illegible]

Peroneal Superficial

age = 38

Stimulation Site	Amp. µV	Latency msec
lateral leg	21	3.2

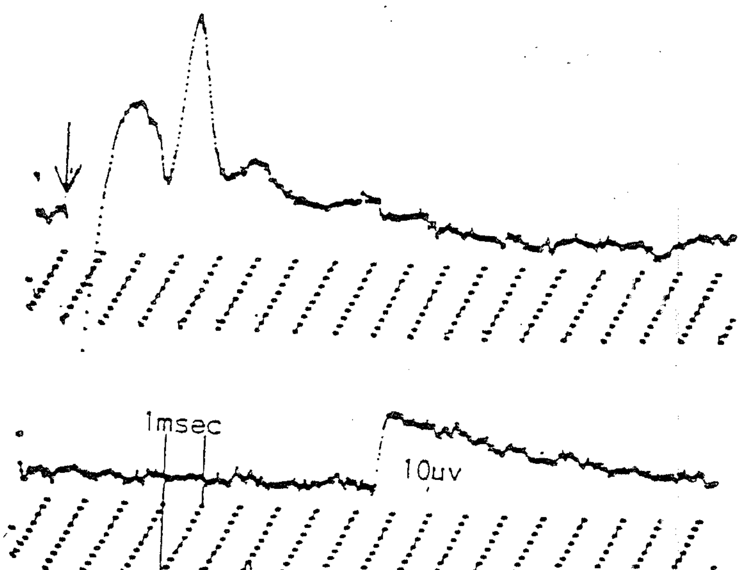
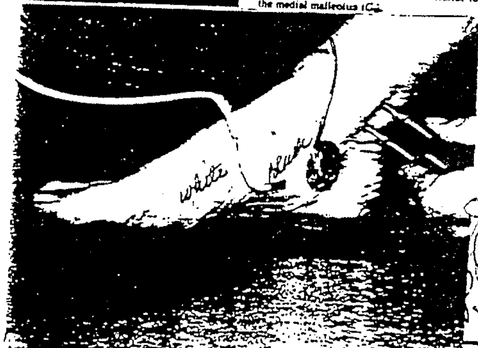
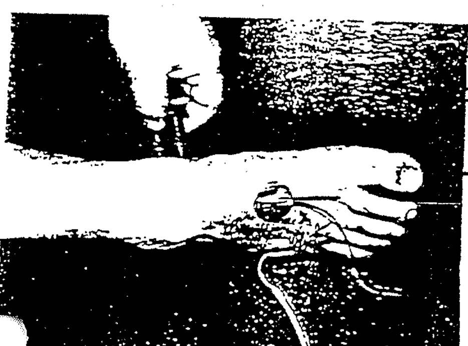
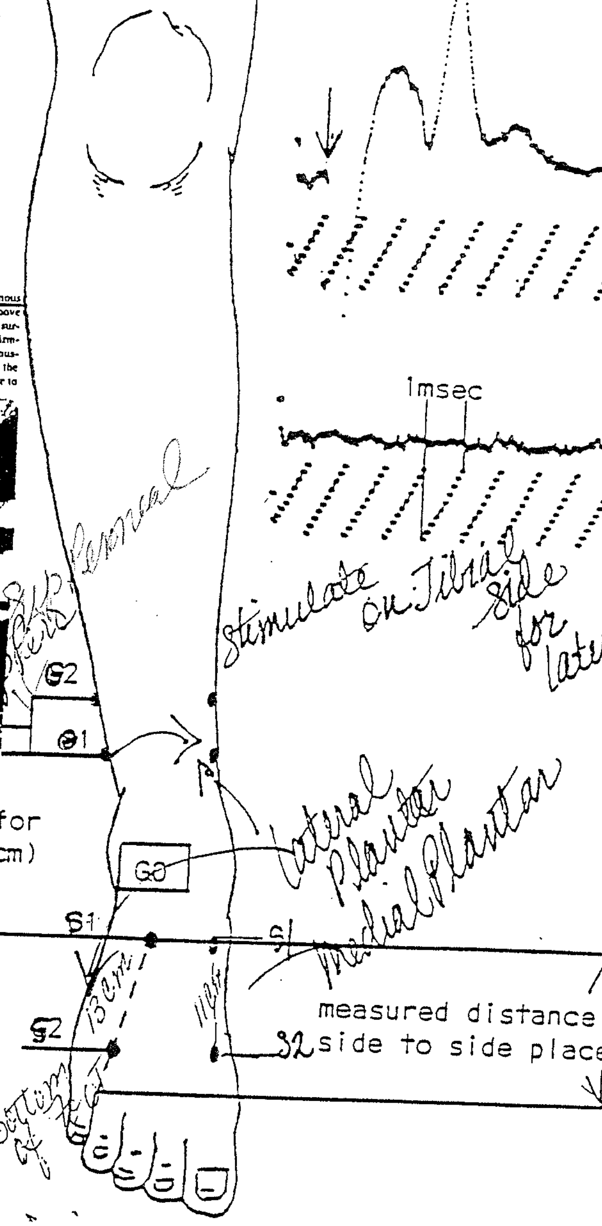


Figure 6-19
Sensory conduction study of the saphenous nerve. The nerve is stimulated 14 cm above the active electrode (G1) along the medial surface of the leg with the electrode pressed firmly between the tibia and gastrocnemius muscle. The recording electrodes are placed at the ankle, 2-3 cm above (G1) and just anterior to the medial malleolus (G2).







for
cm)

measured distance to insure symmetric side to side placement of G1

Figure 6-12
(A) Motor conduction study of the tibial nerve (medial plantar nerve). The nerve is stimulated above the medial malleolus, 10 cm from the recording electrode placed over the belly (G1) and tendon (G2) of the abductor hallucis. (B) Alternative recording site for motor nerve conduction study of the tibial nerve (lateral plantar nerve). The nerve is stimulated below the medial malleolus. The recording electrodes are placed over the belly (G1) and tendon (G2) of the abductor digiti quinti.