Table 1 CMT subtypes: Genes, chromosomal locations, and clinical features

Disorder	Inheritance	Phenotype	Subtype	New Classification	Gene	Chromosome	Clinical Characteristics
CMT1	Autosomal dominant	Demyelinating (MNCV<38 m/s)					AD-Demyelinating CMT; Onset in first or second decade
			CMT1A	AD-CMTde-PMP22dup	17p dup. PMP22	17p12	Classic CMT, palpable hypertrophy of nerves, NCV slowed to <60% normal
			CMT1B	AD-CMTde-MPZ	MPZ	1q23.3	1st–2nddecade;moreseverethanCMT1A; posturaltremor,ataxia(Roussy–Levy);and severephenotypeDSS/CHN(CMT3),inter-mediateandCMT2;lateonsetmildpheno-type;NCScanbepatchy(c.f.CIDP)
			CMT1C	AD-CMTde-LITAF	LITAF	16p13.13	Childhood; nerve hypertrophy; þ/— sensorineural hearing loss
			CMT1D	AD-CMTde-EGR2	EGR2	10q21.3	1st decade; Cranial nerve involvement, scoliosis;andDSS/CHNphenotypes(CMT3)
			CMT1E	AD-CMTde-PMP22	PMP22	17p12 (PM)	Childhood; sensorineural hearing loss; and severe phenotypes DSS/CHN(CMT3)
			CMT1F	AD-CMTde-NEFL	NEFL	8p21	Childhood; Severe disease (more commonly CMT2)
			CMT1 plus	AD-CMTde-FBLN5	FBLN5	14q32.12	4th–5th decade; macular degeneration, skin hyperelasticity
			CMT1	AD-CMTde-PMP2	PMP2	8q21.13	Classical CMT
			CMT1/ SNCV	AD-CMTde-ARHGEF10	ARHGEF10	8q23.3	Asymptomatic SNCV
			HNPP	HNPP-PMP22del HNPP-PMP22	17p del PMP or PMP22 PM	17p12	1st–7th decade; recurrent painless entrapment neuropathies, tomaculae
CMT4	Autosomal recessive	Demyelinating (MNCV<38 m/s)					(AR-CMT1)
			CMT4A	AR-CMTde-GDAP1	GDAP1	8q21.11	Earlychildhood;severe;vocalcordparesis and diaphragm involvement; intermediate and CMT2; andAR
			CMT4B1	AR-CMTde-MTMR2	MTMR2	11q21	2–4 y; Severe, cranial nerve involvement; scoliosis, proximal weakness; focally folded myelin
			CMT4B2	AR-CMTde-SBF2	SBF2/ MTMR13	11p15.4	1st–2nd decade; severe, proximal weakness; kyphoscoliosis, glaucoma; focally folded myelin
			CMT4B3	AR-CMTde-SBF1	SBF1/ MTMR5	22q13.33	1st–2nd decade; severe, scoliosis, pes planus, syndactyly, focally folded myelin
			CMT4C	AR-CMTde-SH3TC2	SH3TC2	5q32	1st–2nd decade; severe CMT, kyphoscoliosis, sensorineural deafness, Schwann cell cytoplasmic extensions; patchy NCV slowing (c.f. CIDP)
			CMT4D	AR-CMTde-NDRG1	NDRG1	8q24.22	1st decade; severe; scoliosis, sensorineural deafness, tongue atrophy; WM lesions MRI (HMSNL)
			CMT4E	AR-CMTde-EGR2	EGR2	10q21.3	Congenital, hypotonia, respiratory involvement, arthrogryposis (DSS/CHN phenotype)
			CMT4F	AR-CMTde-PRX	PRX	19q13.2	1st decade; severe sensory involvement, focally folded myelin
			CMT4G	AR-CMTde-HK1	HK1	10q22.1	1st–2nd decade; severe (HMSN Russe)
			CMT4H	AR-CMTde-FGD4	FGD4	12p11.21	Early childhood; severe, delayed motor milestones, scoliosis
			CMT4J	AR-CMTde-Fig. 4	Fig4	6q21	Congenital, childhood or adult onset; severe; patchy NCV slowing (c.f. CIDP), severe denervation on EMG; ALS phenotype in adults
			CMT4K	AR-CMTde-SURF-1	SURF-1	9q34.2	Childhood; severe; encephalopathy, nystagmus, cerebellar ataxia, white matter lesions, lactic acidosis, Leigh syndrome
			CMT4	AR-CMTde-CNTNAP1	CNTNAP1	17q21.2	Congenital; CHN phenotype; arthrogry-posis; WM lesions.
			CCFDN	AR-CMTde-CTDP-1	CTDP-1	18q23	Classical CMT, cataracts, dysmorphic features

Table 1 (*Continued*)

Disorder	Inheritance	Phenotype	Subtype	New Classification	Gene	Chromosome	Clinical Characteristics
CMT2	Autosomal dominant	Axonal (MNCV>38 m/s)					AD-Axonal CMT; Onset in second or third decade; Sensory predominant
			CMT2A	AD-CMTax-MFN2	MFN2	1p36.2	Congenital - 5th decade; severe, distal predominant, optic neuropathy, hearing loss, vocal cord paralysis, diaphragm weakness, pyramidal; CNS involvement, WM lesions (CMT5/6), rarely recessive
			CMT2A1	AD-CMTax-KIF1B	KIF1B	1p36.22	Classical CMT; tremor
			CMT2B	AD-CMTax-RAB7	RAB7	3q21.3	2nd decade; severe sensory involvement, ulcero-mutilation (HSAN1B)
			CMT2C	AD-CMTax-TRPV4	TRPV4	12q24.1	Congenital-7thdecade;earlieronsetmore severe phenotype, ulcero-mutilation, vocal cord paralysis(SPSMA)
			CMT2D	AD-CMTax-GARS	GARS	7p15	2nd–4th decade, distal upper limb (dHMN5A)
			CMT2	AD-CMTax-BSCL2	BSCL2	11q12.3	Distal upper limb weakness (dHMN5/SPG17)
			CMT2E	AD-CMTax-NEFL	NEFL	8p21.2	1st–5th decade; sensorineural hearing loss, hyperkeratosis; can have SNCV, rare AR (CMTDIG, CMT1F)
			CMT2F	AD-CMTax-HSPB1	HSPB1	7q11.23	Adult; motor predominant (HMN2B)
			CMT2G	AD-CMTax-Unknown	Unknown	12q12–13.2	2nd decade; classical CMT
			CMT2I	AD-CMTax-MPZ	MPZ	1q23.3	late; classical CMT; and intermediate (CMT1B)
			CMT2J	AD-CMTax-MPZ	MPZ	1q23.3	2nd–6th decade; sensorineural hearing loss, tonic pupils; and intermediate, (CMT1B)
			CMT2K	AD-CMTax-GDAP1	GDAP1	8q21.11	Late (AD); vocal cord paresis, pyramidal signs; severe form AR; (CMT4A)
			CMT2L	AD-CMTax-HSPB8	HSPB8	12q24.23	2nd–4th decade; motor predominant (HMN2A)
			CMT2M	AD-CMTax-DNM2	DNM2	19p13.2	1st–2nd decade; cataract, ophthalmoplegia, ptosis; tremor; neutropenia, intermediate (CMTDIB)
			CMT2N	AD-CMTax-AARS	AARS	16q22.1	2nd–6th decade; classical CMT
			CMT2O	AD-CMTax-DYNC1H1	DYNC1H1	14q32.31	Childhood; intellectual impairments, delayed motor milestones (SMALED1)
			CMT2P	AD-CMTax-LRSAM1	LRSAM1	9q33.3-q34.1	3rd–5th decade; mild sensory predominant phenotype; asymmetrical; and AR
			CMT2Q	AD-CMTax-DHTKD1	DHTKD1	10p14	2nd–3rd decade; classical CMT, pes cavus
			CMT2T	AD-CMTax-MME	MME	3q25.2	4th–6th decade; classical CMT (and AR)
			CMT2U	AD-CMTax-MARS	MARS	12q13.3	Late; sensory and motor
			CMT2V	AD-CMTax-NAGLU	NAGLU	17q21.2	Late; sensory predominant; pain
			CMT2W	AD-CMTax-HARS	HARS	5q31.3	Late; sensory predominant; motor forms
			CMT2Y	AD-CMTax-VCP	VCP	9p13.3	Classical CMT
			CMT2Z	AD-CMTax MORC2	MORC2	22q12.2	Asymmetric; proximal, sensory predominant, pyramidal signs
			CMT2CC	AD-CMTax-NEFH	NEFH	22q12.2	Classical CMT
			CMT2DD	AD-CMTax-ATP1A1	ATP1A1	1p13.1	2nd–6th decade; classical CMT
			CMT2	AD-CMTax-MT-ATP6	MT-ATP6	—	1st–2nd decade; motor, pyramidal; relapsing
			CMT2	AD-CMTax-TUBB3	TUBB3	16q24.3	Late onset; ptosis; EOMCMT2; CFEOM3
			CMT2	AD-CMTax-DGAT2	DGAT2	11q13.5	Early; sensory ataxia; tremor; slow progression
			CMT2	AD-CMTax-BAG3	BAG3	10q26.11	Late; cardiomyopathy
			CMT2 with giant axons	AD-CMTax-DCAF8	DCAF8	1q23.2	Childhood; mild cardiomyopathy; NEFL accumulations on nerve biopsy

Table 1 (*Continued*)

Disorder	Inheritance	Phenotype	Subtype	New Classification	Gene	Chromosome	Clinical Characteristics
			HMSNP	AD-CMTax-TFG	TFG	3q12.2	2nd–6th decade; proximal, tremor, diabetes mellitus
			SPG10	AD-CMTax-KIF5A	KIF5A	12q13.3	Classical CMT; pyramidal
	Autosomal recessive	Axonal (MNCV>38 m/s)	CMT2B1	AR-CMTax-LMNA	LMNA	1q22	2nd decade; mild-severe, rapid, proximal
			CMT2B2	AR-CMTax-MED25	MED25	19q13.33	3rd–5th decade; classical CMT
			CMT2B5	AR-CMTax-NEFL	NEFL	8p21.2	1st decade; severe
			CMT2F	AR-CMTax-HSPB1	HSPB1	7q11.23	2nd–3rd decade; motor predominant; proximal; dHMNIIB
			CMT2H	AR-CMTax-GDAP1	GDAP1	8q21.11	1st decade; vocal cord paresis, pyramidal signs
			CMT2K	AR-CMTax-GDAP1	GDAP1	8q21.11	1st decade; severe, vocal cord paresis, scoliosis; and CMT4A, CMTR1A
			CMT2P	AR-CMTax-LRSAM1	LRSAM1	9q33.3-q34.1	2nd–4th decade; cramps, erectile dysfunction
			CMT2R	AR-CMTax-TRIM2	TRIM2	4q31.3	Infantile; vocal cord paralysis
			CMT2S	AR-CMTax-IGHMBP2	IGHMBP2	11q13.3	Classical CMT; (SMARD1)
			CMT2T	AR-CMTax-HSJ1	HSJ1/DNAJB2	2q35	Classical CMT, motor predominant (DSMA5)
			CMT2T	AR-CMTax-MME	MME	3q25.2	4th–6th decade; classical CMT
			CMT2X	AR-CMTax-KIAA8140	KIAA8140/ SPG11/ ALS5	15q21.1	2nd decade; pyramidal
			HMSN VI	AR-CMTax-MFN2	MFN2	1p36.22	1st decade; optic atrophy
			NMAN	AR-CMTax-HINT1	HINT1	5q23.3	1st decade; neuromyotonia; motor predominant
			GAN	AR-CMTax-GAN	GAN	16q23.2	1st decade; severe, CNS involvement; milder classical CMT
			CMT2/ SPG55	AR-CMTax-C12orf65	C12orf65	12q24.31	1st decade; optic atrophy
			CMT2	AR-CMTax-MCM3AP	MCM3AP	21q22.3	Congenital-2nd decade; slow progression; scoliosis, claw hands; delayed motor development; ophthalmoplegia, þ/— intellectual impairment
			CMT2	AR-CMTax-COA7	COA7	1p32.3	1st–4th decade; pes cavus, cerebellar ataxia
			CMT2	AR-CMTax-SCO2	SCO2	22q13.33	Congenital- 1st decade; motor predominant; cardiomyopathy
CMTX	X-linked	Axonalloss and demyelination		XL-CMT			
	XD		CMTX1	XL-CMTin-GJB1 XL-CMTdeGJB1 XL-CMTaxGJB1	GJB1	Xq13.1	1st–2nd decade; classical CMT, male predominant, positive sensory symptoms, split hand, occasional sensorineural hearing loss, WM lesions, encephalopathy; CMT2, Intermediate and patchy demyelinating NCS (c.f. CIDP)
	XR		CMTX2	XL-CMT-Unknown	Unknown	Xp22.2	Childhood, males only, intellectual impairment, axonal and demyelinating NCS
	XR		CMTX3	XL-CMT-Unknown	78kb Ins. Ch8	Xq27.1	Childhood, males, sensory predominant
	XR		CMTX4 (Cowchock syndrome)	XL-CMT-AIFM1	AIFM1	Xq26	Childhood, male predominant, axonal, deafness, intellectual impairment, learning difficulties; females milder phenotype
	XR		CMTX5	XL-CMT-PRPS1	PRPS1	Xq22.3	Childhood, males only, sensorineural deafness, retinopathy, optic neuropathy (late)
	XD		CMTX6	XL-CMT-PDK3	PDK3	Xp22.11	Childhood, classical CMT
			CMTXI	XL-CMT-DRP2	DRP2	Xq22.1	

Table 1 (*Continued*)

Disorder	Inheritance	Phenotype	Subtype	New Classification	Gene	Chromosome	Clinical Characteristics
							2nd–6th decade; classical CMT<pes cavus, autism, slow progression
Intermediate CMT		Intermediate (MNCV>25 m/s and <38 m/s)		CMTin			
	Autosomal dominant		CMTDIA	AD-CMTin-Unknown	Unknown	10q24.1–25.1	1st–2nd decade; classical CMT
			CMTDIB	AD-CMTin-DNM2	DNM2	19p13.2	Intermediate; neutropenia; cataracts; ophthalmoplegia; ptosis; CMT2M
			CMTD1C	AD-CMTin-YARS	YARS	1p35.1	1st–6th decades; Classical CMT
			CMTDID	AD-CMTin-MPZ	MPZ	1q23.3	4th–6th decade; classical CMT, deafness, pupil disorders
			CMTDIE	AD-CMTin-IFN2	IFN2	14q32.33	1st–3rd decade; classical CMT; FSGS; proteinuria; renal failure; WM lesions
			CMTDIF	AD-CMTin-GNB4	GNB4	3q26.33	1st–5th decades; classical CMT
			CMTDIG	AD-CMTin-NEFL	NEFL	8p21.2	1st–5th decade; pes cavus, pyramidal, delayed motor milestones, CNS involvement (CMT1F, CMT2E)
			CMTD1	AD-CMTin-DCTN2	DCTN2	12q13.3	4th–5th decades; motor predominant, pes cavus
	Autosomal recessive		CMTRIA	AR-CMTin-GDAP1	GDAP1	8p21.11	Classical CMT (CMT2K, CMT4A)
			CMTRIB	AR-CMTin-KARS	KARS	16q23.1	Classical CMT; learning difficulties, vestibular schwannoma
			CMTRIC	AR-CMTin-PLEKHG5	PLEKHG5	1p36.31	Variable onset; classical CMT; SMA
			CMTRID	AR-CMTin-COX6A1	COX6A1	12q24.31	1st decade; classical CMT

Abbreviations: AD, autosomal dominant; ALS, amyotrophic lateral sclerosis; AR, autosomal recessive; CHN, congenital hypomyelinating neuropathy; CIDP, chronic inflammatory demyelinating polyneuropathy; CMT, Charcot–Marie–Tooth disease; CNS, central nervous system; dHMN, distal hereditary motor neuropathies;DSS,Dejerine–Sottassyndrome;EMG,eletromyogram;FSGS,focalsegmentalglomerulosclerosis;HMSNL,hereditarymotorandsensory neuropathy Lom; HNPP, hereditary neuropathy with liability to pressure palsies; HSAN, hereditary sensory and autonomic neuropathy; MPZ, myelin protein