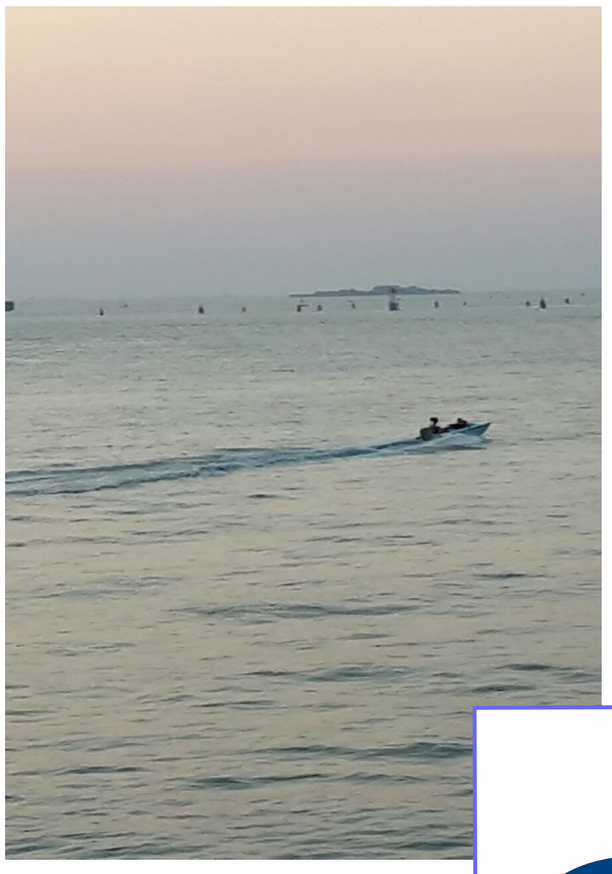

DIAGNOSTIC-THERAPEUTIC PATHWAY (PDTA) IN OUR NEUROPHYSIOLOGICAL OUTPATIENT CLINIC: RATE OF HEREDITARY NEUROPATHIES IN A FIRST LEVEL HOSPITAL

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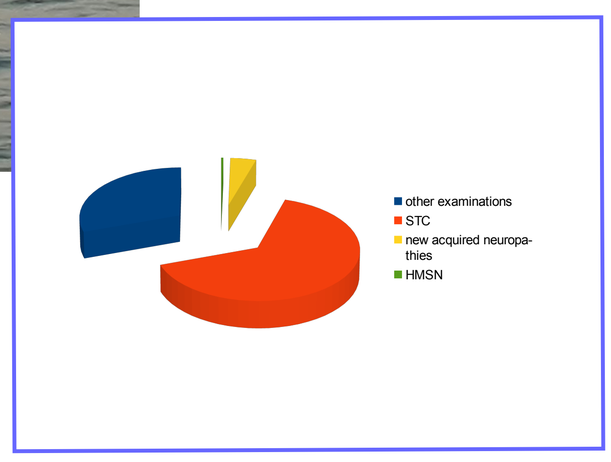
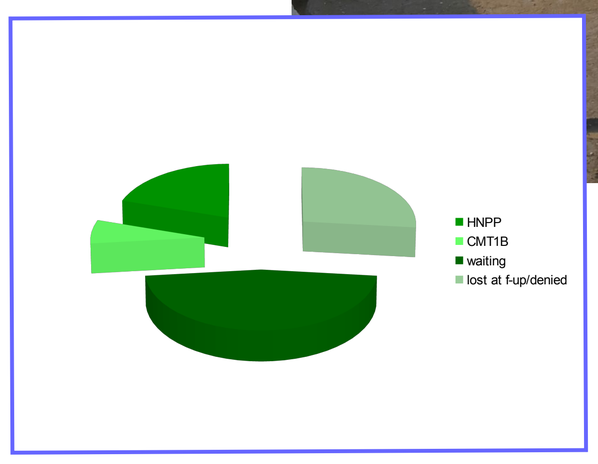
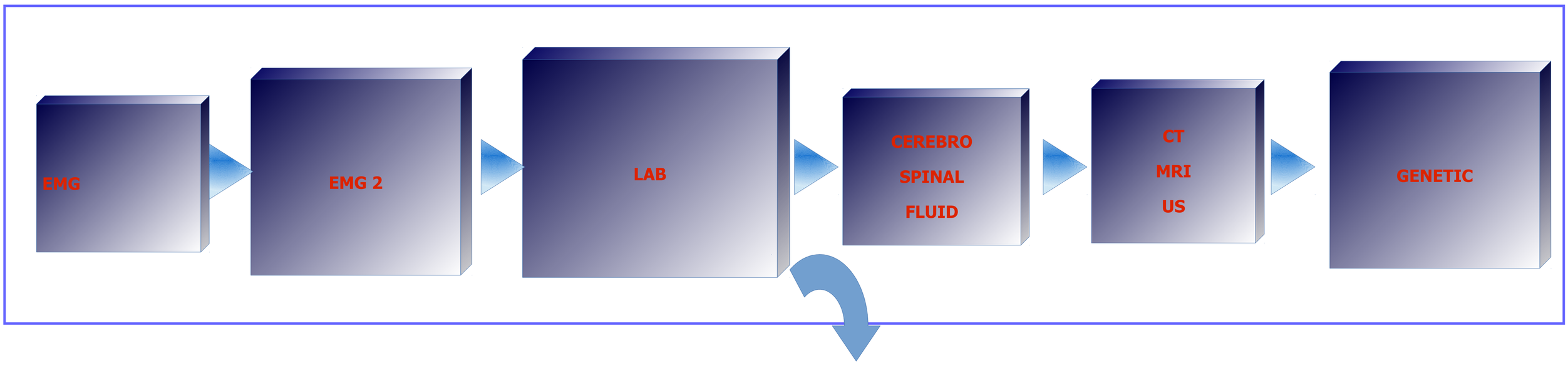
CMT is the most common heterogeneous group of inherited peripheral nerve disorders caused by a growing plethora of genetic mutations, affecting both the motor and the sensory nerves, that may bring an amount of physical disability. Clinical phenotypes change according to the age of onset and the most remarkable neurophysiological data, but there's a broad overlap with the acquired neuropathies that must be excluded before approaching the genetic testing.

In out first level-"spoke" hospital, stakeholders' interest on Neurophysiology has been developed in the last 2 years to perform quickly ever-growing requests, especially because of the most widespread nerve entrapment syndrome, the carpal tunnel syndrome (CTS). A specific outpatient clinic has been reorganized to admit patients from general practitioners and specialists. A neurophysiology technician and a neurologist performed 4200 exams: among them about 65% were CTS, but 195 were admitted to the neuropathic outpatient clinic for a new diagnosis of neuropathy and we found 16 patients (8%) probably affected by hereditary sensory-motor neuropathy (Charcot MarieTooth): the mutations have already been identified in 4 of them (3 HNPP, 1 CMT1B), haven't been found jet in other 9 of them and further 3 patients denied genetic counselling

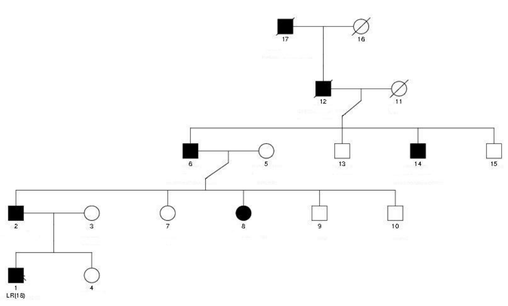


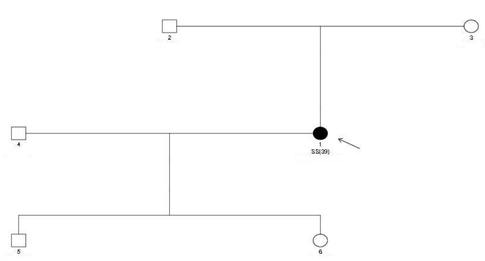


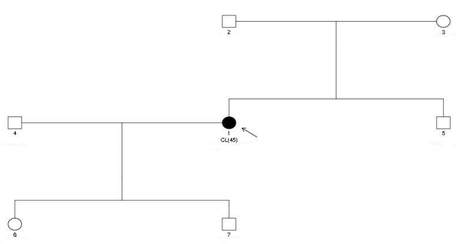


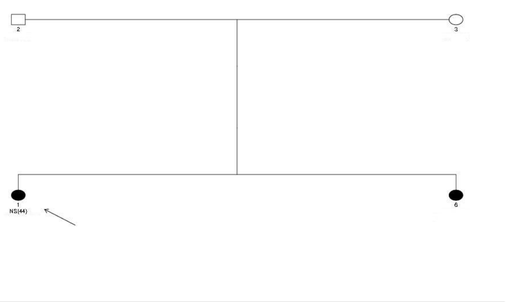
Index patient	Address	Birthdate year	Genotype/ Phenotype correlation	Clinical data	M median			M ulnar wrist-below elbow			M ulnar below-elbow-elbow		Sensory median			Sensory ulnar		
					DL	Amp	MCV	DL	Amp	MCV	Amp	MCV	DL	Amp	SCV	DL	Amp	SCV
L.R.	CORNUDA	1988	HNPP/PMP22 del	SPE palsy, foot deformity, scoliosis, informative pedigree	5.4	9.6/9.7	51	3.3	8.5/7.4	48	7.4/7.5	22	4.3	7	35	3.6	10	33
S.S.	CORNUDA	1977	HNPP/PMP22 del	Bilateral ulnar palsy, pes cavus	5.5	6.1/5.7	43	3.6	8.3/6.9	43	6.8/6.2	43	5.3	5	29	3.1	7	39
C.L.	CASTELLO DI GODEGO	1971	HNPP/PMP22 mut (p.Trp124Stop)	Suspected CTS	12.1	7.4/8.5	44	5.6	8.2/6.9	54	6.3/6.4	29	NR	NR	NR	NR	NR	NR
N.S.	RESANA	1972	CMT1B/MPZ (mut c.306 delA exon 3)	Suspected CTS previous genetic diagnosis (2008 Mandich)	12.1	3.8/2.8	33.1	2.9	6/4.1	32.8	4.3/4.6	36.2	NR	NR	NR	3.3	14	36.4
M.F.	POVE DEL GRAPPA	1957	waiting	Pes cavus, hammer toes, restless leg syndrome	4.35	10.2/9.2	50	2.8	13.8/11	46	11/10.2	38	4.55	3.6	37.4	3	9.4	53.3
L.D.	MONTEBELLUNA	1940	waiting	pes cavus, hammer toes, restless legs syndrome, walking difficulties: father, daughter	5.2	4.7/5.1	43	3	9.5/6.9	46	6.3/6.4	46	3.6	6	46	3	11	44
C.Z.	VIDOR	1941	waiting	Missionary; walking difficulties: father, an aunt and her siblings, brother	4.4	6.1/5.8	61	2.7	2.5/2	66	27/16	34	2.8	12	52	2.1	10	55
B.N.	BORSO DEL GRAPPA	1967	waiting	Numbness and tingling in feet and hands, distal weakness. peripheral nerve ultrasound scan: diffuse increased CSA (2013 Briani)	3.8	11/5.8	29	3.1	8.2	N.D.	4.2	29.3	N.D.	11.5	41.2	N.D.	N.D.	N.D.
A.B.	RIESE PIO X	1952	waiting	Saturday night palsy, tingling and scoparesthesias	5	9.3/7.5	44	2.9	7.6/7.1	50	7.1/6.7	31	3.4	21	49	2.8	17	46
S.M.	CASTELLO DI GODEGO	1979	waiting	Suspected CTS foot deformity; walking difficulties: father	3.8	8.3/7.7	62	2.5	11/9.7	55	9.7/10	64	3.7	3	52	3	2	50
R.R.	CORNUDA	1944	waiting	Foot deformity; SPE palsy; a sister with the same neurophysiological data; other 2 sisters affected by facio-scapulo-cerural dystrophy	3.4	5/4.7	48	3.1	8.9/9.8	53	9.8/9.3	61	2.9	27	59	2.6	28	54
M.C.	LORIA	1989	waiting	Suspected CTS; cold dissestesias; nocturnal ulnar paresteseas; surgically-treated foot deformity (pes equinus); scoliosis; walking difficulties and foot deformity: mother, 2 motherlow's great-aunts (2014 Pieroaqulo)	3.3	11.2/11.5	53	2.9	6.3/5.6	46	5.6/5.6	54	2.3	58	60	2	47	61
L.S.	CASTELFRANCO-VENETO	1947	waiting	Recurrent CTS and ulnar palsy, pes cavum and hammer toes, hypotrophic hands; hammer toes: sisters	4.1	7.5/7.2	55	4.5	7.7/8.1	61	8.3/5.5	36	3.3	4	36	3.7	8	33
G.A.	RESANA	1941	lost at follow-up	Recurrent CTS, at elbow-ulnar entrapment	5.1	2.7/2.3	48	3.2	7.3/4.8	50.5	4.8/4.2	40.7	8.7	5.5	41.3	3	5.3	42.4
R.P.	MONTEBELLUNA	1941	lost at follow-up	Saturday night palsy, CTS	5.4	8.5/6.4	53.1	3.65	10/9.1	54.5	9.3/8.4	51.4	4.4	4.8	35.7	11.8	11.3	40.7
T.B.	CASTELFRANCO-VENETO	1969	denied	Saturday night palsy, foot paresthesias, congenital cataract	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.

ROUTINE	INFLAMMATORY	PARANEOPLASTIC	INFECTIOUS
THORAX XR	ESV, RCP	CA125, CA72-4, CA15-3, CA19-9, CEA	HBV, HCV
Haemocrom, Glucose, urea, creatinine, Na, K, Ca, GGT, ALT, AST, TSH, FT3, FT4	Ab antiDNA, ENA, ANA, ANCA, CIC, C3, C4, C1Q, CRIOGLOBULINS	AFP	VDRL
B12, FOLATE	Ab anti-GANGLIOSIDES	PSA	HIV
PROTEIN and IG PROFILE	Ab anti-MAG	BETA2 MICROGLOBULIN	CMV, EBV
CK, LDH, ALDOLASE, LACTATE, MYOGLOBULIN			Borrelia Burgodorferi









N. S.

Motor NCS

Nervo / Posizioni	Latency ms	Amp.1-2 mV	Distanza cm	Velocità m/s	Pos. reg
D MEDIAN - APB					
Polso	12,10	3,8			ABP
Gomito	18,75	2,8	22	33,1	ABP
D ULNAR - ADM					
Polso	2,90	6,0			ADM
Sottogomito	9,45	4,1	21,5	32,8	ADM
Sopragomito	12,35	4,6	10,5	36,2	ADM

Sensory NCS

Nervo / Posizioni	Sito reg.	Amp.p-p µV	Latenza ms	Distanza cm	Velocità m/s	Amp.1-2 µV
D NERVO GENERALE - Mano Antidromica						
Polso	I dito rad	11,2	4,00	15,5	38,8	5,3
Polso	I dito med				NR	NR
Polso	III dito med				NR	NR
Polso	V dito uln	18,0	3,30	12	36,4	14,0

Motor Nerve Conduction:

Nerve and Site	Latency	Amplitude	Segment	Latency Difference	Distance	Conduction Velocity
L Median						
Wrist	5.4 ms	9.6 mV	Abductor pollicis brevis-Wr	5.4 ms	mm	m/s
Elbow	10.1 ms	9.7 mV	Wrist-Elbow	4.7 ms	240 mm	51 m/s
Axilla	12.5 ms	9.1 mV	Elbow-Axilla	2.4 ms	130 mm	54 m/s
R Ulnar						
Wrist	3.3 ms	8.5 mV	Abductor digiti minimi Wrist	3.3 ms	mm	m/s
Below elbow	7.9 ms	7.4 mV	Wrist-Below elbow	4.6 ms	220 mm	48 m/s
Above elbow	13.0 ms	7.5 mV	Below elbow-Above elbow	5.1 ms	110 mm	22 m/s

Sensory Nerve Conduction:

Nerve and Site	Latency	Amplitude	Segment	Latency Difference	Distance	Conduction Velocity

S.S.

Motor Nerve Conduction:

Nerve and Site	Latency	Amplitude	Segment	Latency Difference	Distance	Conduction Velocity
R Median						
Wrist	5.5 ms	6.1 mV	Abductor pollicis brevis-Wrist	5.5 ms	mm	m/s
Elbow	10.8 ms	5.7 mV	Wrist-Elbow	5.3 ms	230 mm	43 m/s
Axilla	15.6 ms	5.4 mV	Elbow-Axilla	4.8 ms	215 mm	45 m/s
R Ulnar						
Wrist	3.6 ms	8.3 mV	Abductor digiti minimi (manus)-Wrist	3.6 ms	mm	m/s
Below elbow	9.0 ms	6.9 mV	Wrist-Below elbow	5.4 ms	230 mm	43 m/s
Above elbow	12.9 ms	5.2 mV	Below elbow-Above elbow	3.9 ms	120 mm	31 m/s

Sensory Nerve Conduction:

Nerve and Site	Latency	Amplitude	Segment	Latency Difference	Distance	Conduction Velocity
R HAND						
Digit I radial	3.8 ms	4 mV	Wrist -Digit I radial	3.8 ms	135 mm	36 m/s
Digit I median	4.2 ms	6 mV	Wrist -Digit I median	4.2 ms	120 mm	29 m/s
Digit III median	5.3 ms	5 mV	Wrist -Digit III median	5.3 ms	150 mm	29 m/s

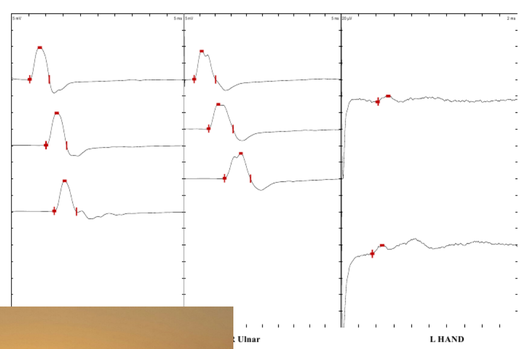
C.L.

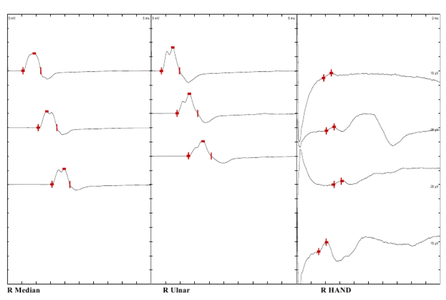
Motor Nerve Conduction:

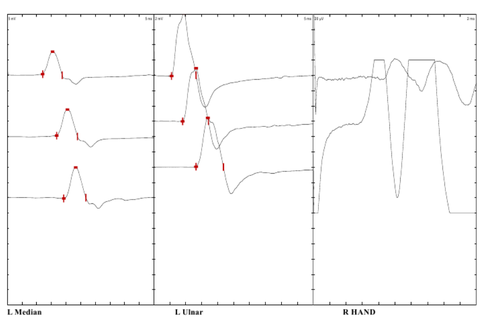
Nerve and Site	Latency	Amplitude	Segment	Latency Difference	Distance	Conduction Velocity
L Median						
Wrist	12.1 ms	7.4 mV	Abductor pollicis brevis-Wrist	12.1 ms	mm	m/s
Elbow	16.9 ms	8.5 mV	Wrist-Elbow	4.8 ms	210 mm	44 m/s
Axilla	19.3 ms	10.2 mV	Elbow-Axilla	2.4 ms	125 mm	52 m/s
L Ulnar						
Wrist	5.6 ms	8.2 mV	Abductor digiti minimi (manus)-Wrist	5.6 ms	mm	m/s
Below elbow	9.1 ms	6.9 mV	Wrist-Below elbow	3.5 ms	190 mm	54 m/s
Above elbow	13.3 ms	6.4 mV	Below elbow-Above elbow	4.2 ms	120 mm	29 m/s

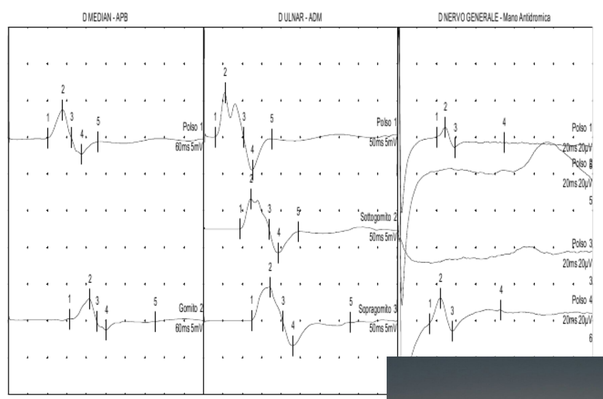
Sensory Nerve Conduction:

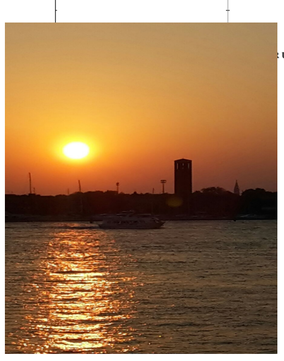
Nerve and Site	Latency	Amplitude	Segment	Latency Difference	Distance	Conduction Velocity





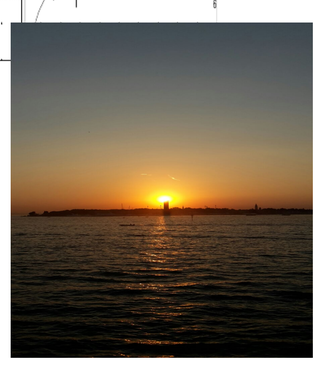






We follow patients step by step: they can be admitted to the day-service clinic to perform lumbar puncture.

Differential diagnosis requires extensive laboratory screening for treatable diseases.

Secondary forms excluded, patients undergo a primary genetic counselling in our outpatient clinic and if they are prone, they are referred to the genetic testing. Our referral genetic lab is the Neuropathological Unit-Department of Neurosciences- Verona's University.

If the mutation is found, patients are admitted to our local geneticist for another final counselling and are invited to be in touch with our outpatient clinic once per year, since management is supportive and multidisciplinarity is fostered.