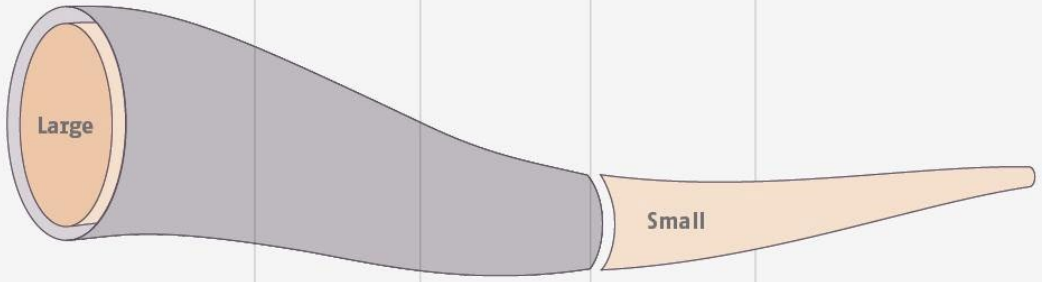
SUDOSCAN

Powered by WITHINGS

How do you assess small fibers neuropathy in your daily practice?

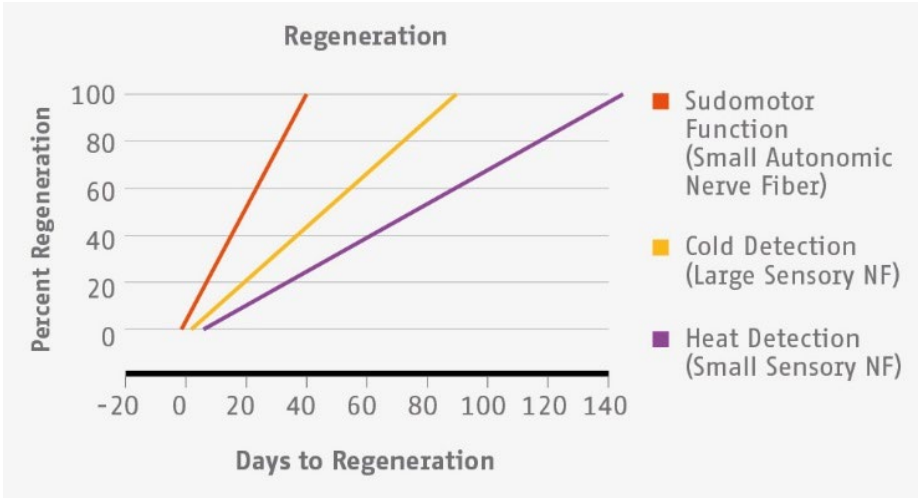
THE SWEAT FUNCTION IS CONTROLLED BY THE PERIPHERAL AUTONOMIC NERVES (SMALL NERVE FIBERS)

Motor	Sensory			Autonomic	
Myelinated	Myelinated	Thinly Myelinated	Un-Myelinated	Thinly Myelinated	Un-Myelinated
A alpha	A alpha/beta	A delta	C	A delta	C
Muscle control	Touch, vibration, position, perception	Cold perception pain	Warm perception pain	Heart rate, blood pressure, sweating, GIT, GUT, function	



The peripheral nervous system is made of large and small fibers. The small, unmyelinated C fibers are in charge of autonomic functions such as sweating.

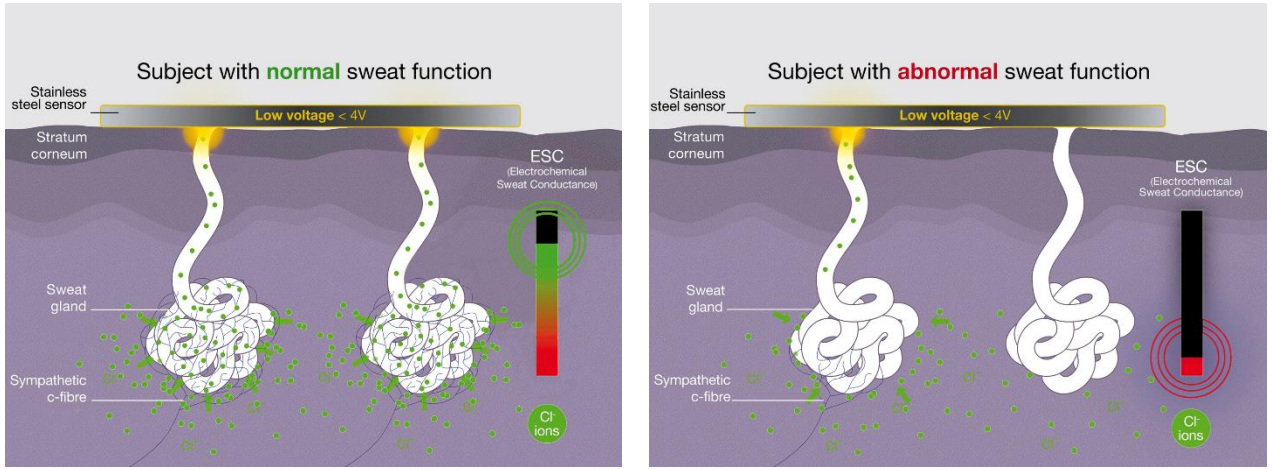
Adapted from Vinik et al. Nature Clinical Practice Endocrinology & Metabolism. 2006;2:269



Small fiber autonomic nerves regenerate more quickly than the large fiber nerves upon capsaicin application.

Adapted from Gibbons et al. Capsaicin induces degeneration of cutaneous autonomic nerve fibers. Ann Neurol. 2010;68:888-898

SUDOSCAN EVALUATES NEUROPATHIES BY MEASURING THE SWEAT GLANDS ABILITY TO RELEASE CHLORIDE IONS FOLLOWING A STIMULATION



- Low voltage (<4V) applied to the skin (hands and feet) through stainless steel electrodes.
- Chloride ions are attracted to the electrodes.
- Electrochemical reaction between the electrodes and chloride ions.
- Conductance recording:
  - **High conductance**: no malfunction of the sweat and therefore no function neuropathy
  - **Low conductance**: dysfunction of the sweat function and presence of neuropathy

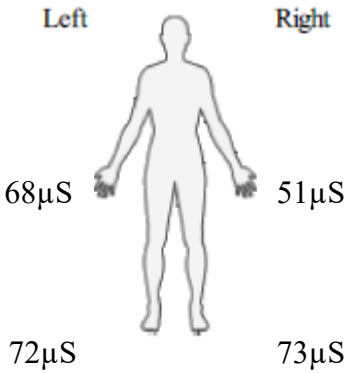
3 MINUTES
SIMPLE
NON-INVASIVE
QUANTITATIVE
OBJECTIVE

SUDOSCAN : OBJECTIVE AND REPRODUCIBLE RESULTS IN 3 MINUTES

Easy to read …

Displayed immediately after each test, the results are easy to read and interpret.

- *Here the patients has both feet in the green zone which indicates an absence of neuropathy.*
- *But his right hand has a lower conductance than the left hand.*



… Quantitative result for each limb …

The quantitative measure for each limb is clearly indicated and the percentage of **asymmetry** is displayed to guide the diagnosis.

- *Here the right hand has a significantly lower conductance of 51µS, when the left hand has 68µS. The asymmetry between left and right hands is of 25%.*

… With maximum Quality Control

For each test the device detects if the patients moves and whether it affects the results.

- *Here the patient moved his right hand during the scan. You can chose to re-do the test for more accurate results.*

How to interpret a SUDOSCAN result

	Orange Zone	Yellow Zone	Green Zone
Hands ESC	0-40	40-60	60-100
Feet ESC	0-50	50-70	70-100
Sudomotor Dysfunction	Severe dysfunction = **severe neuropathy**	Moderate dysfunction = **moderate neuropathy**	No dysfunction = **no neuropathy**

The two main variables to take into account for a correct interpretation of SUDOSCAN results are:

- **Location of disturbances** (hands and/or feet) to evaluate length dependency of the damage.
- **Asymmetry**: If greater than 20% it may suggest damage limited to a single side. It can help for etiology.

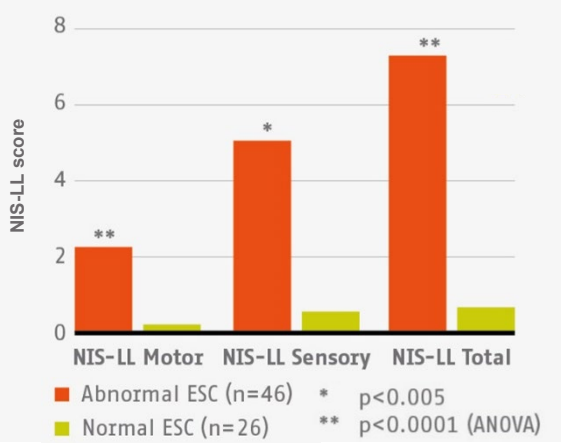
In the diagnostic strategy the following questions should also be answered:

- **What ?** Are there other signs or symptoms of autonomic or small fiber dysfunction? Are sensory or motor nerves (large fibers) involved?
- **When ?** If symptoms are present, how long have they been present and was their onset acute or chronic?
- **Context ?** What are the patient's medical history, current or past medications, family history (hereditary diseases)?

SUDOSCAN IS HIGLY SENSITIVE COMPARED WITH SKIN BIOPSY, AND OTHER TECHNIQUES TO ASSESS PERIPHERAL NEUROPATHY

Screens Diabetic Peripheral Neuropathy

Bar graph comparing NIS-LL questionnaire (Neuro-Impairment Score in the Lower Limb) with ESC



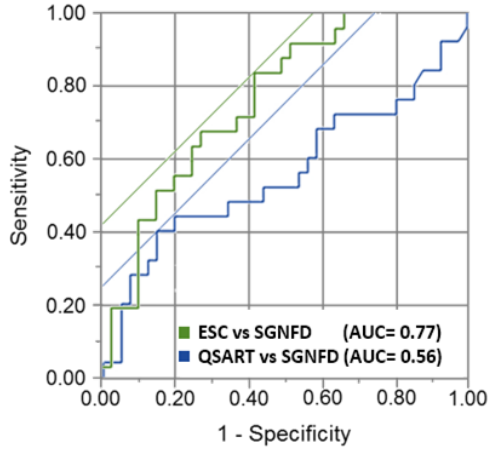
Specificity: 76.2%
Sensitivity: 87.5%

Sudoscan compares to clinical tests (NIS-LL) for a quick, objective and quantified Neuropathy detection.

Publication: Vinik AI, Nevoret ML, Casellini C. **The new age of sudomotor function testing: a sensitive and specific biomarker for diagnosis, estimation of severity, monitoring progression, and regression in response to intervention**. Frontiers in Endo 2015;Jun 11;6:94.

Correlates with skin biopsy

ROC Curve comparing ESC and QSART with SGNFD (biopsy)



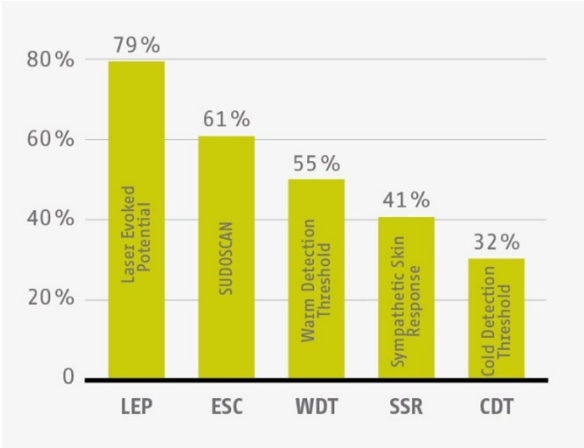
ESC vs. SGNFD : AUC = 0.77
QSART vs. SGNFD: AUC = 0.54

Significative correlation between the analysis of **structure** (Biopsy with SGNFD) and small fiber **function** (ESC).

Publication: Novak P. **Electrochemical Skin Conductance Correlates with Skin Nerve Fiber Density.** Frontiers in Aging Neuroscience. 2016;8.

Positively compares with 5 other techniques for SFPN

Diagnostic performance: Percentage of patients with at least one abnormal test



Specificity: 92.5%
Sensitivity: 75.8%

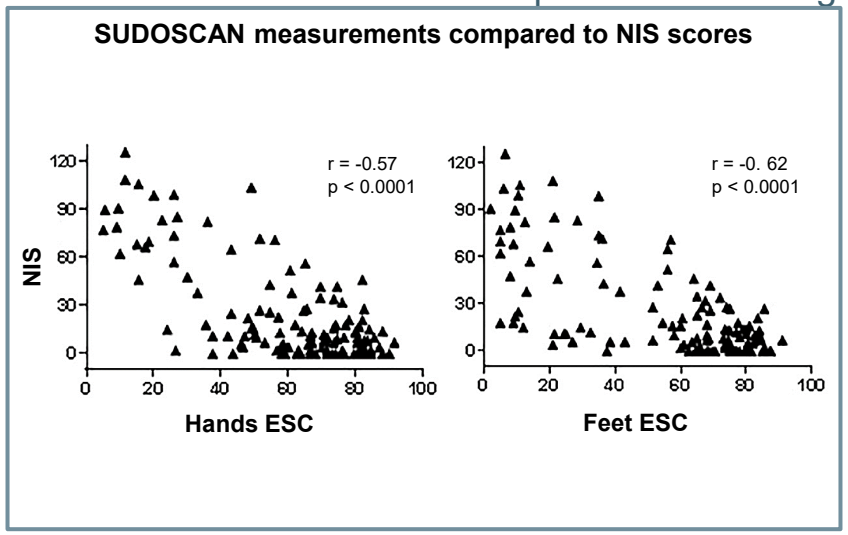
An easy, rapid and reliable method compared to other tests to assess painful Small Fiber PolyNeuropathy.

Publication: Lefaucheur JP., et al. **Diagnosis of small fiber neuropathy: A comparative study of five neurophysiological tests**. Neurophysiol Clin. 2015 Dec;45(6):445-55.

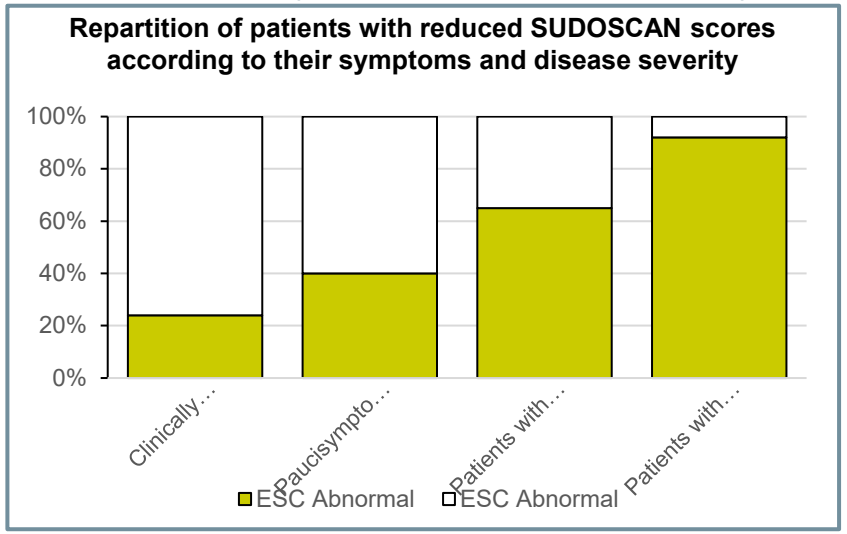
SUDOSCAN HIGHLIGHTS SYMPTOMS EVEN AT A PRECLINICAL STAGE (DEMONSTRATED IN TTR AMYLOIDOSIS POPULATION)

Publication: JP Lefaucheur et al. Clin Neurophysiology, 129 (2018) 1565–1569

- The study aimed to prospectively assess the distal involvement of small autonomic fibers in TransThyretin Familial Amyloid Polyneuropathy.
- ESC measures correlates well with the severity of TTR-FAP. ESC is an early marker : reduced in 24% of asymptomatic patients.
- ESC measures did not differ between patients according to the type of TTR variant (Val30M or other mutations).



ESC measures were found to correlate with patients' clinical status assessed by the Neuropathy Impairment Score.



adapted from results section data

ESC were reduced in 24% of clinically asymptomatic patients, 40% of paucisymptomatic patients, 65% of patients with moderate TTR-FAP, and 92% of patients with advanced TTR-FAP.

Method

- 126 patients with Val30Met (n=65) or non-Val30Met (n=61) TTR mutation. Including clinically asymptomatic (n=21) & paucisymptomatic (n=30) patients, moderate (n=37) or advanced (n=38) TTR-FAP
- Other tests included : Neuropathy Impairment Score (NIS); Karnofsky Performance Status (KPS); Modified Polyneuropathy Disability Score (mPND).

GUIDELINES MENTIONING SUDOSCAN

AACE – Position statement on testing for Autonomic and Somatic Nerve dysfunction

- "[SUDOSCAN] is a noninvasive objective test, takes a mere 2 minutes, has a sensitivity for diagnosis of neuropathy >75% and a specificity of >95%."
- "When combined with indices of HRV, [SUDOSCAN] provides better predictive value for CVD and mortality than traditional risk factor."

ATTReuNET Network – Recommendations for TTR-Familial Amyloid Polyneuropathy

- SUDOSCAN is used "to disclose early abnormalities of distal small nerve fiber function."

French High Authority of Health (HAS) - National Protocol for Diagnosis and Care for Familial Amyloidosis Neuropathy

- The HAS recommends Sudoscan "to explore the involvement of small nerve fibers" in Paraclinical evaluation
- Sudoscan is recommended as a vegetative test for the "screening and follow-up denervation & early neuropathy"

GUIDELINES MENTIONING SUDOSCAN :

ALAD (Latin-America Diabetes Association) “Expert consensus for management of diabetic neuropathy”

- The ALAD mentions SUDOSCAN as a method of preference for evaluating sudomotor dysautonomia and explain the importance of “postganglionic sudomotor function” in special section about SUDOSCAN

Polish Diabetes Association - Guidelines on the management of diabetic patients

- Polish guidelines recommend the use of SUDOSCAN for the “evaluation of sudomotor function”

New England Journal of Medicine - Diabetic Sensory and Motor Neuropathy (Clinical Practice)

- Pr. Vinik recommends to test sudorimetry with SUDOSCAN to “to obtain objective measures of sweating”

German Diabetes Society - Practice recommendation for Diabetic Neuropathy

- The German Diabetes Society recommends the Sudoscan for the evaluation of the sweat function which they recognize as a clinically important manifestation zone of autonomic diabetic neuropathy in diabetes mellitus.

GUIDELINE RELATED TO SFN DIAGNOSIS

American Academy of Neurology - Autonomic Testing Policy

- Mentions the long history of using sudomotor testing and that it is “the most sensitive means to detect a peripheral small fiber neuropathy”
- Recommends Autonomic testing and Sudomotor testing for all diabetic patients

American Diabetes Association – Standards of medical care in diabetes

- Diabetes guidelines recommend screening for complications in all diabetes patients including:
  - DPN assessment once a year
  - Assessment of autonomic neuropathy

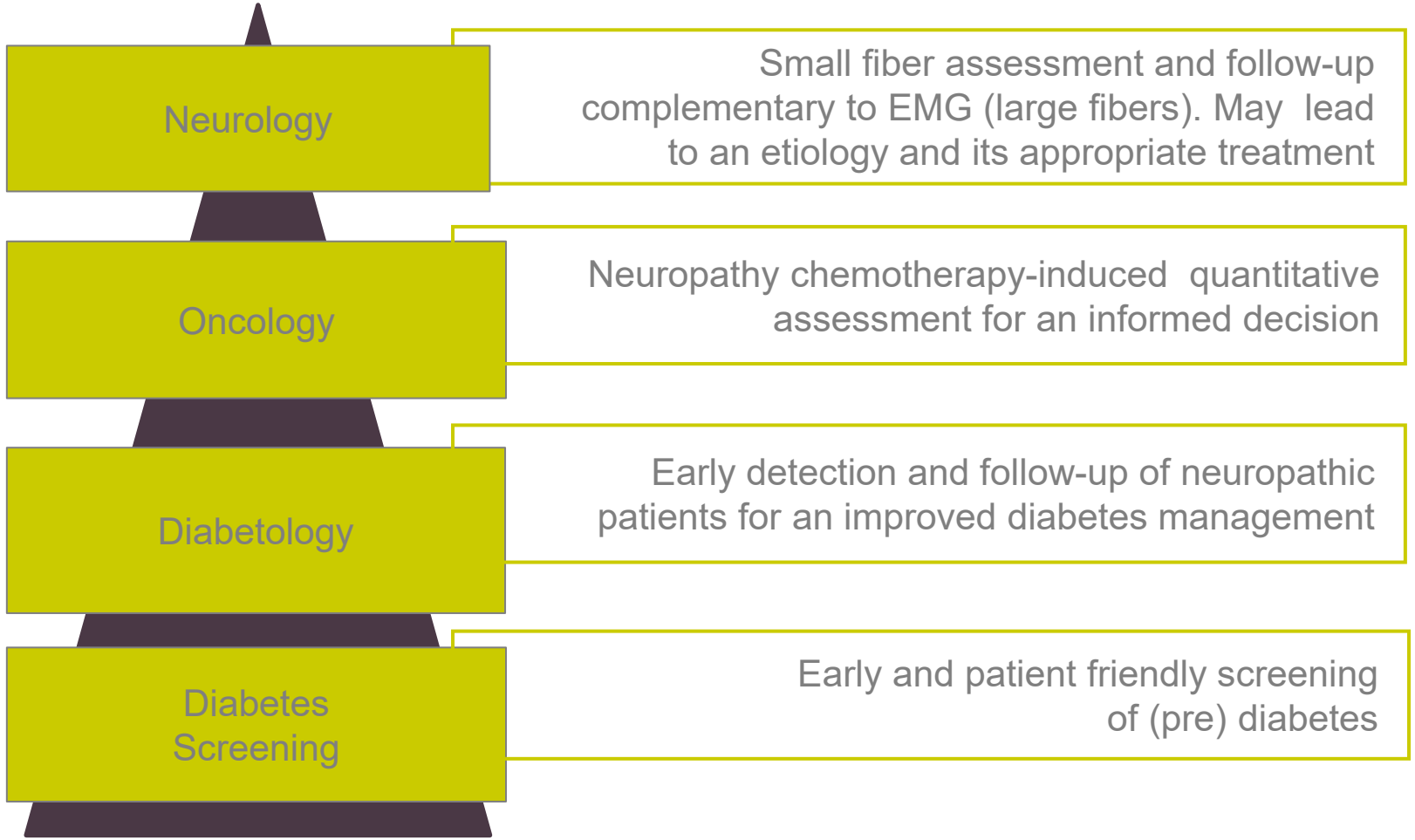
American Academy of Clinical Endocrinology – Clinical Guidelines for Diabetes Care Plan

- Sudomotor function “detects early neurophysiologic abnormalities in peripheral autonomic function”.
- “variants of diabetic neuropathy such as Small Fiber Neuropathies […] present predominantly with pain and autonomic features”
- “Painful neuropathies may have no physical signs, and diagnosis may require […] measures of small-fiber neuropathy”

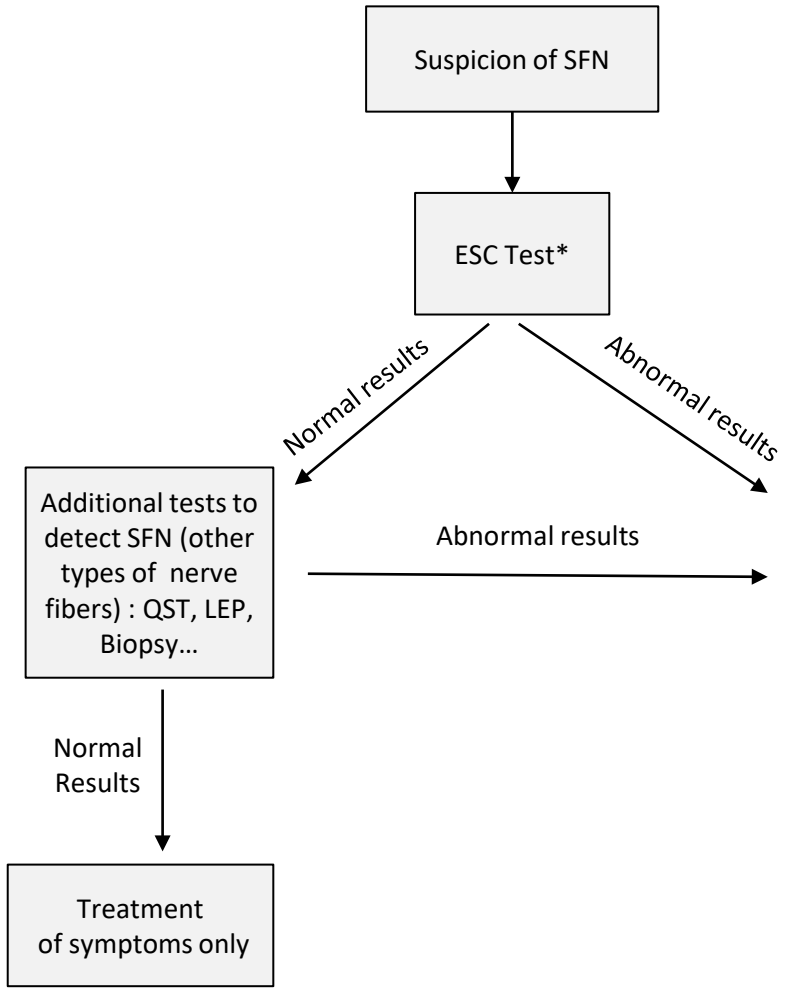
Toronto Diabetic Neuropathy Expert Group – Diabetic Neuropathies: Update

- “[Small Fiber] loss is an early feature of diabetes, progresses with increasing neuropathic severity, and may repair with early intervention”
- “Assessment of sudomotor dysfunction contributes to the detection of autonomic dysfunction in Diabetic Painful Neuropathy.”

EARLY DIAGNOSIS & FOLLOW-UP OF SMALL FIBER NEUROPATHIES



SUDOSCAN TO ASSESS AND MONITOR SMALL FIBERS, COMPLEMENTARY TO EMG (LARGE FIBERS). MAY LEAD TO AN ETIOLOGY AND ITS APPROPRIATE TREATMENT.



Assessment to determine the etiology

Systematic
- Search for a toxic intake
- Electromyogram
- Biological assessment: Complete blood count, Creatinine, HbA1c (± OGTT), lipid profile, TSH, CRP, EPP, vitamin B12, HBV serology, HCV, HIV, antinuclear antibodies, anti-SSA antibodies, anti-transglutaminase IgA antibodies

On specific sign of disease or second intention
- Investigation of sarcoidosis (thoracic imaging, accessory salivary gland biopsy, angiotensin convertase)
- Investigation of Amyloidosis
- Investigation of neoplasia
- Lyme disease serology
- Native anti-DNA antibody

Only on specific sign of disease
- Alpha-galactosidase A deficiency (Fabry disease)
- Ceruloplasmin (Wilson's disease)
- Investigation of Ehlers Danlos's disease
- Other viral serologies
- In the event of a negative balance sheet: isolated SFN
- Discuss, in case of a young subject with a family history, the Investigation of a mutation of the sodium channels (Nav1.7, Nav1.8, etc.)
- Investigation of a syndrome of sleep apnea (SAS) may be proposed in case of clinical evidence, even if the connection between small fibers neuropathy and SAS is still discussed

Pathologies which may include SFN

Metabolic
- Diabetes, glucose intolerance
- Too rapid decrease of glycaemia
- Dysthyroidism
- Vitamin B12 deficiency, Vitamin B1
- Chronic renal failure
- Dyslipidemia
- Wilson's disease

Infectious
- HIV,
- Hepatitis C
- Lyme disease
- Poxvirus
- Epstein Barr Virus (EBV)
- Influenza Virus
- Chagas disease

Auto immune - inflammatory
- Sjogren's Syndrome
- Systemic lupus
- Sarcoidosis
- Vasculitis
- Celiac disease
- Rheumatoid arthritis
- Amyloidosis
- Monoclonal gammopathy of undetermined significance

Toxic
- Alcohol
- Antibiotics (metronidazole, nitrofurantoin, linezolid)
- Statins
- Chemotherapy (bortezomib, etc.)
- Anti-TNF

Specific treatment for each pathology

* As a first-line test as it is simple, quick and well tolerated by patients

Adapted from Langlois et al. Rev Med Interne. 2018 Feb;39(2):99-106

SUDOSCAN TO MONITOR PATIENTS ACCORDING TO CLINICAL STATE

Electrochemical Skin Conductance

Sudoscan

Healthy Carriers of Family Amyloid Polyneuropathy, Asymptomatic patients	Test once a year (see guidelines)	Monitor when the Sudoscan results start to lower, indicating first symptoms	Start the treatment early, as soon as the first symptoms appear
Patients under treatment: Diabetes, Amyloidosis, Sjogren's syndrome, Painful neuropathy…..	Follow-up Test	Monitor the evolution of Sudoscan conductances	Follow the side effects of treatment.
Patients exposed to a toxic agent: Anti-cancer treatment	Follow-up Test	Monitor the evolution of Sudoscan conductances	SFN evolution monitoring according to the patient's treatment course - Possible modification of the treatment

SUDOSCAN
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Sudoscan

- ✓ **An innovative technology to diagnose and monitor small fiber neuropathies**
- ✓ **Quick, simple, objective**
- ✓ **Quantitative and reproducible with immediate results**
- ✓ **Provides small fibers assessment to complement EMG results (large fiber assessment) for a more complete evaluation**
- ✓ **To help diagnose etiologies linked with C fiber neuropathies and follow-up complications**
  - Painful neuropathies
  - Diabetic neuropathies
  - Amyloidosis induced neuropathies
  - Chemotherapy-induced neuropathies
  - Sjogren Syndrome-related neuropathies
- ✓ **Reimbursement**

SUDOSCAN

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Q&A

SUDOSCAN NORMATIVE VALUE BASED ON OVER 1000 PATIENTS

- **General data on the method (Normative SUDOSCAN ESC values in adults and children and accuracy)**

Study	Number of subjects	Aim of the study	Main result 1	Main result 2	Main result 3
Vinik (2016)	n= 1350	Normative values in adults	Mean ESC for women or men at the hands (75 [57-87] vs. 76 [56-89] µS, p=0.35) or feet (83.5 [71-90] vs. 82.5 [70-91] µS, p=0.12)	No gender effect Very small decrease with age	Very high correlation between right and left side
Pereon (2016)	n=100	Normative values in children	Measurement possible starting at age 2 years	Comparable normative values to adults	-
Bordier (2016)	n=32	Accuracy of the method in controls (HV) and patients (P) (3 devices, 6 Measurements)	Coefficient of variation feet ESC 3% in HV and 7% in P	Coefficient of variation hands ESC 4% in HV and 7% in P	-

* Healthy populations to derive normative ranges of test results against which to compare disease states

- Vinik AI, Smith AG, Singleton JR, Callaghan B, Freedman B, Tuomilehto J, Bordier L, Bauduceau B, Roche F. **Normative values for Electrochemical Skin Conductances and Impact of Ethnicity on Quantitative Assessment of Sudomotor Function.***Diabetes Tech and Ther [in press]*. Abstract here
- Pereon Y. **Normative values in children**. Clinical neurophysiology. 2016
- Bordier L, Dolz M, Monteiro L, Névoret M-L, Calvet JH, Bauduceau B. **Accuracy of a rapid and non-invasive method for the assessment of small fiber neuropathy based on measurement of electrochemical skin conductances**. *Front. Endocrinol.29 Feb 2016. doi: 10.3389/fendo.2016.00018.* Full Article

DEMONSTRATED PERFORMANCE OF SUDOSCAN TO DETECT PERIPHERAL NEUROPATHY IN DIABETES

- **Diagnostic performance for detection of peripheral neuropathy in patients with diabetes – Pivotal studies**

Study	Number of subjects	Diagnostic Variable	Comparison	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
Casellini (2013)	n=293	DPN	NIS-LL	78	92	75	94
Selvarajah (2015)	n=70	DPN	AAN guidelines for DPN	88	76	-	-
Smith AG (2014)	n=97	DPN	UENS	77	67	59	83
Yajnik (2012)	n=265	DPN	VPT	73	62		-

- Casellini CM, Parson HK, Richardson MS, Nevoret ML, Vinik AI. **SUDOSCAN, a non-invasive tool for detecting diabetic small fiber neuropathy and autonomic dysfunction.** *Diabetes tech and ther 2013; 15(11):948-53* **Full article**
- Selvarajah D, Cash T, Davies J, Sankar A, Rao G, Grieg M, Pallai S, Gandhi R, Wilkinson ID, Tesfaye S. **SUDOSCAN: A Simple, Rapid, and Objective Method with Potential for Screening for Diabetic Peripheral Neuropathy.** *PLoS One. 2015 Oct 12;10(10):e0138224.* Full Article
- Smith AG, Lessard M, Reyna S, Doudova M, Singleton JR. **The Diagnostic Utility of Sudoscan for Distal Symmetric Peripheral Neuropathy.** *J Diab and its Complic 2014;28(4):511-6* **Full article**
- Yajnik CS, Kantikar VV, Pande AJ, Deslypere JP. **Quick and simple evaluation of sudomotor function for screening of diabetic neuropathy.** *ISRN Endocrinology 2012;2012:103714* **Abstact here**

SUDOSCAN: A DEMONSTRATED INTEREST IN FOLLOW UP OF THE PATIENT BASED ON GOOD REPRODUCTIBILITY

- **Performance of the method in the follow-up of patients**

Study	Number of subjects	Aim of the study	Main result 1	Main result 2	Main result 3
Raisanen (2013)	n=154	Measure the benefit of exercise on cardiometabolic health	ESC correlates with VO2 max	Greater improvement of ESC in subjects performing the highest level of activity	No significant improvement of other parameters (weight, waist, VO2max)
Casellini (2016)	n=70	Measure the benefit of bariatric surgery on autonomic function	Feet ESC and CAN improve 12 weeks after bariatric surgery in diabetics	Somatic nerve measures do not improve (NCS, QST)	Gastric bypass and the sleeve gastrectomy showed similar results
Syngle (2014)	n=60	Effect of treatment on autonomic neuropathy in Rheumatoid Arthritis and Ankylosing Spondylitis	Improvement of ESC with treatment	Improvement of other tests for autonomic neuropathy (HRV)	-
Saad (2016)	n=88	Neurotoxicity in oncology	Decrease of ESC with increasing doses of chemotherapy	Aggravation of Clinical score in parallel	-

- Casellini C, Parson H, Hodges K, Edwards J, Lieb D, Wohlgemuth S, Vinik AI. **Bariatric Surgery Restores Cardiac and Sudomotor Autonomic C-fiber Dysfunction towards Normal in Obese Subjects with Type 2 Diabetes**. *Plos One. 2016 May 3.* Full article here
- Raisanen A, Eklund J, Calvet JH, Tuomilehto J. **Sudomotor Function as a Tool for Cardiorespiratory Fitness Level Evaluation: Comparison with Maximal Exercise Capacity.** *Int. J. Environ. Res. Public Health 2014;11:5839-48* Full article
- Syngle A, Verma I, Krishan P, Garg N, Syngle V. **Disease-modifying anti-rheumatic drugs improve autonomic neuropathy in arthritis: DIANA study.** *Clin Rheumatol. 2015;34(7):1233-41*. Abstract here
- Saad M, Psimaras D, Tafani C, Sallansonnet-Froment M. **Quick, non-invasive and quantitative assessment of small fiber neuropathy in patients receiving chemotherapy.** *J Neurooncol. 2016 Apr;127(2):373-80*. Abstract here

GOOD SPECIFICITY & SENSIBILITY COMPARED TO OTHER SMALL FIBER ASSESSMENT TECHNIQUES

- **Comparison to other methods for small fiber assessment**

Study	Number of subjects	Diagnostic Variable	Comparison with	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
Smith (2014)	n=97	SFN (Clinical score)	ESC / IEFND	77 / 63	67 / 63	59 / 73	83 / 52
Lefaucheur (2015)	n=87	SFN (reference tests)	LEP / ESC /WDT	64 / 49 / 45	87 /93 /91	-	
Novak (2016)	n=81	SFN	IEFND / SGNFD	Correlation with IEFND : 0.73	Correlation with SGNFD : 0.64	-	

- Smith AG, Lessard M, Reyna S, Doudova M, Singleton JR. **The Diagnostic Utility of Sudoscan for Distal Symmetric Peripheral Neuropathy.** *J Diab and its Complic 2014;28(4):511-6* **Full article**
- Lefaucheur JP, Wahab A, Plante-Bordeneuve V, Sene D, et al. **Diagnosis of small fiber neuropathy: a comparative study of five neurophysiological tests.***Neurophysiol Clin. 2015 Dec;45(6):445-55.* Abstract here
- Novak P. **Electrochemical Skin Conductance Correlates with Skin Nerve Fiber Density.** Frontiers in Aging Neuroscience. 2016;8. Full Article here

SUDOSCAN VALIDATED IN OTHER NEUROLOGICAL INDICATION

- **Neurology – Rare diseases**

Study	Number of subjects	Aim	Main result 1	Main result 2
Sahuc (2016)	n=36	Fabry disease	Decrease in ESC in patients	Higher decrease with hypohidrosis
Castro (2016)	n=133	Familial amyloidosis	Dramatic decrease in patients	Higher decrease in patients with orthostatic hypotension

- Sahuc P, Chiche L, Dussol B, Pouget J, Franques J. **Sudoscan as a noninvasive tool to assess sudomotor dysfunction in patients with Fabry disease: results from a case-control study.** *Ther Clin Risk Manag. 2016 Feb 2;12:135-8*. Full Article
- Castro J, Miranda B, Castro I, de Carvalho M, Conceição I. **The diagnostic accuracy of Sudoscan in Transthyretin Familial Amyloid Polyneuropathy.** *Clin Neurophys. 2016 Feb 27.* Abstract here

SMALL FIBER TESTING & SUDOSCAN

	Test	Test Duration	Immediate results	Quantitative	Objective	Easy to operate	Patient Friendly	Reproducible	Autonomic Nerves
Small fiber	Biopsy	30 min	>1 month	✓	✓			✓	✓
	QSART	20-60min	✓	✓	✓				✓
	Quantitative Sensory Testing*	20-40 min	✓	Semi		✓			
	Sympathetic Skin Response	20-40 min	✓	Semi					✓
	SUDOSCAN	2 min	✓	✓	✓	✓	✓	✓	✓
Large fiber	ElectroMyoGram	1h	✓	✓	✓			✓	

*QST: Warm/Cold detection, Warm/Cold Pain, Vibration, pin-prick sensation

REFERENCES - EUROPE

Sheffield Teaching Hospitals Sheffield (UK)	Leiden University Medical Center Leiden (Netherlands)	Deutsches Diabetes Zentrum Düsseldorf (Germany)
Hospital Universitario La Paz, Universidad Autónoma de Madrid (Spain)	Hôpital Pitié Salpêtrière Paris (France)	Università di Milano-Bicocca Milan (Italy)
Jordi Gol Research Institute Barcelona (Spain)	CHU Kremlin-Bicêtre Paris (France)	Università di Rome Tor Vergata Rome (Italy)

REFERENCES - WORLD

		PWH 香港糖尿病及肥胖症研究所 HONG KONG INSTITUTE OF DIABETES AND OBESITY HK Institute of Diabetes and Obesity, Prince of Wales Hospital, Hong Kong (SAR)
		Apollo Sugar Clinics PROVEN DIABETES CARE Apollo Sugar Clinics Delhi, Chennai, Hyderabad (India)
INCMNSZ Instituto Nacional de Ciencias Médicas y Nutrición Salvador Zubirán. Mexico DF (Mexico)	EBSERH HOSPITAIS UNIVERSITÁRIOS FEDERAIS MINISTÉRIO DA EDUCAÇÃO Hospital Universitario de Brasilia Brasilia (Brazil)	معهد دسمان للسكري Dasman Diabetes Institute Dasman Diabetes Institute Koweit City (Koweit)

CONCLUSIONS & TESTIMONIALS

Prof. JP. Lefaucheur - CHU Henri Mondor (Paris, France), Center of reference for Small Nerve Fibers for the Paris Hospitals - **255 publications**

« A very good correlation was observed between ESC measures and the severity of TTR-FAP assessed on various clinical variables (NIS, mPND, KPS, and BMI). »

ESC measurement could detect abnormalities in clinically asymptomatic patients, possibly providing an early marker of disease onset.

Lefaucheur JP, al. **The value of electrochemical skin conductance measurement using Sudoscan® in the assessment of patients with familial amyloid polyneuropathy.** Clinical Neurophysiology. 2018;129(8):1565-1569..

Prof. P. Novak – Hopital Brigham & Women's Faulkner, Harvard Medical School (Boston, MA, USA).

SUDOSCAN's advantages include « the capacity for grading of abnormalities and the use of ESC values as longitudinal measurements for assessing disease progression. »

« The association between ESC and SGNFD, along with the high reproducibility of ESC measurements, is particularly promising. »

Novak P. **Electrochemical skin conductance: a systematic review**. Clinical Autonomic Research. 2017;.

Prof. AI. Vinik - Director of the Strelitz Diabetes and Neuroendocrine Center, Eastern Virginia Medical School (USA) - **450 publications, 8 books**

"SUDOSCAN has shown to be useful in the detection of Peripheral Autonomic Diabetic Neuropathy as well as Diabetic Nephropathy."

"The results of this report show […] the clinical utility of SUDOSCAN as an endpoint measure in interventional studies."

Vinik AI, et al. **Bariatric Surgery Restores Cardiac and Sudomotor Autonomic C-Fiber Dysfunction towards Normal in Obese Subjects with Type 2 Diabetes**. PLOS ONE. 2016;11(5):e0154211

Prof. S. Tesfaye - Diabetes Research Unit, Sheffield Teaching Hospital, (Sheffield, UK). - **141 publications**

« SUDOSCAN has a great diagnostic utility and excellent sensitivity & specificity against the Toronto Clinical Score. »

Since SUDOSCAN takes only 3minutes, it allows to do multiple exams in a short period of time.
« Patients thought this was fantastic, they just came for 1 appointment and had everything done. »

Tesfaye S. **Combined retinal/neuropathy/renal screening service: an effective model for early detection of diabetic peripheral neuropathy.** Presentation presented at; 2016; EASD 2016.

Prof. D. Ricard - HIA Percy (Paris, France) – **100 publications**

"SUDOSCAN […] could be used for early screening of small fiber neuropathy and in the follow-up of patients in order to detect CIPN."

This would allow oncologists to address patients to neurologists earlier in order to improve patient management and limit sequelae.

Ricard D. et al **Quick, non-invasive and quantitative assessment of small fiber neuropathy in patients receiving chemotherapy.** J Neurooncol. 2016 Apr;127(2):373-80.

Prof. JP. Lefaucheur - CHU Henri Mondor (Paris, France), Center of reference for Small Nerve Fibers for the Paris Hospitals - **255 publications**

SUDOSCAN, combined with other SFN tests, « appears a relevant approach for the diagnosis of SFN ».

SUDOSCAN has a significantly better diagnostic sensitivity to SSR and CDT, these three tests, LEP, WDT, and ESC, had and their combination further improves diagnostic accuracy.

Lefaucheur JP, al. **Diagnosis of small fiber neuropathy: a comparative study of five neurophysiological tests.** Neurophysiol Clin. 2015 Dec;45(6):445-55.

SUDOSCAN

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