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Intraoperative Neuromonitoring Functional Neurosurgery **Pain Treatment** Neurological Diagnostics

RF Pain Treatment

>> LG2 Lesion Generator

2 Channel



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Introduction



The treatment of pain – chronic pain in particular – is always a therapeutic challenge.

Complex physiological processes as well as individual variations in patients require a high level of professional competence, experience and, usually, comprehensive multidisciplinary therapeutic approaches for successful treatment.

Overview of RF Pain Treatment

RF Pain Treatment RF Pain Therapy RF Thermolesion

inomed supports your therapeutic concept with technically advanced systems and comprehensive auxiliary equipment for interventinal & minimally invasive pain therapy.

RF Pain Treatment

Persisting pains inherently already are a great burden and frequently trigger a series of secondary reactions such as muscle tensing, shortening and hardness. Patients adopt compensatory positions and thus strain originally healthy structures.

This is the beginning of a vicious circle that has to be broken.

After precise diagnosis and the identification of indications, a wide range of therapeutic options are available to the therapist. The majority of patients can be helped with non-invasive therapies, frequently in combination.

In a large patient group, these methods unfortunately do not lead to lasting therapeutic success. In these cases, only interventional pain treatment provides lasting relief.

Once the pain is interrupted, this in itself may already lead to pain relief or physiotherapy or medication treatment can now be used effectively.

RF Pain Therapy - interventional and minimally invasive

Interventional pain treatment takes advantage of minimally invasive procedures with the aim of lasting pain relief through selective interruption or modification of the pain signal conduction along the affected nerve pathways. This is either achieved by targeted injection of medication or by the interruption of the pain signal conduction through neuro-destructive procedures. For this, percutaneous, minimally invasive procedures are the best choice.

Under visual control and electrical stimulation monitoring, specifically directed electrodes, probes or catheters are generally inserted through tubes depending on the method:

- for application of cold onto peripheral nerves cryolesion
- for thermal lesion of nervous tissue radiofrequency thermal lesion
- for application of chemical substances

The nerve areas responsible for motor function are not affected!

"Elimination or at least considerable reduction of the pain gives the body the chance to recover or even to heal by itself."

RF Thermolesion

With correct identification of the indication, radiofrequency thermal lesion is an extremely precise, effective and safe method with many fields of application to combat chronic pain.

Since it can be carried out at the outpatient clinic under local anaesthetic, it is not very stressful for the patient.

The thermal action of a high-frequency current of about ~500 kHz has already been used for decades in high-frequency surgery for cutting and tissue ablation during surgical procedures. High-frequency current causes an electrolyte shift. This ion movement causes a marked development of heat in the tissue close to the electrode.

At temperatures of 60 - 90 °C, this is known as thermal coagulation which enables functional elimination of the pain fibres.

Percutaneous procedures for pain treatment require precise control of the coagulation effect. The aim is an irreversible coagulation as effective as possible over the desired area. This is made possible by measuring and monitoring all coagulation parameters such as voltage, current, impedance, temperature evolution and time of application. The cannula diameter and length of the active tip have an influence on the lesion.

Modern RF devices for percutaneous pain treatment procedures generally use digital temperature regulation (a micro-thermal element is integrated in the electrode tip) which, on the one hand, can be adjusted to the electrode and, on the other, enables the generation of defined temperature-time curves.

Procedure

- X-ray-guided positioning of the cannula / electrode under local anaesthetic
- identification of the target point with direct nerve stimulation
- temperature or temperature profile mode for RF thermolesion

Here, too, the principle applies that only the elimination of the primary pain first makes other useful therapeutic measures possible.

Cannulas and Electrodes

A major advantage of the radiofrequency thermolesion is the opportunity to be able to perform high-precision procedures with very delicate instruments. The instrument dimensions are determined by the indication and the target area.

inomed offers users a broad range of the most diverse electrodes and cannula systems.

Application of RF-Thermolesion

- Facet joint denervation lumbar-, thoracic- and cervical spine
- Sacroiliac joint
- Trigeminal neuralgia (Thermolesion of the ganglion Gassari)
- Rhizotomy





Surface area with abdominal electrode placement

1. General Procedure

The identification of the correct target area during RF Thermolesion depends on the specific application fields. Therefore inomed offers particular workshops for training on specific RF techniques.

1.1. Diagnostics

A test blockade by injection of a local anaesthetic with x-ray CT control monitoring must confirm that the nerve "identified" in the pain anamnesis and thorough physical examinations is actually responsible for the pain.

1.2. Treatment

Localisation of target area

• with x-ray or CT monitoring, the cannula advanced into the target area.

Localisation of target point by electrical stimulation

- electrophysiological position monitoring through electrical stimulation via electrodes / cannulas
- the required stimulation intensity is an approximate measure for the electrode / nerve distance
 - 0.1 mA ~ 0.5 mm
 - 1 mA ~ 2 mm

The correct placement of the neutral surface electrodes using monopolar electrodes is important, because the current flow of the RF Thermolesion depends on it. For facet denervation an abdominal electrode placement is recommended.

After positioning and bone contact

- motor stimulation check: 2 Hz, 3 5 mA or 3 5 V to avoid any motor nerve branch impairment
- sensory stimulation: 50 Hz, tingling of the painful area, otherwise re-positioning

Parameters for adjustment of electrical stimulation

Direct nerve stimulation:	o – max. 10 mA or o – max. 10 V
	(impedance 1 kOhm , $1 \text{ mA} = 1 \text{ V}$)
Sensory stimulation:	50 – 100 Hz,
	pulse width 100 – 200 µsec
Motor stimulation:	2 – 5 Hz,
	pulse width 100 – 200 µsec

Lesion

According to indication and method

- radiofrequency thermal lesion
- pulsed radiofrequency treatment

Methodology





RF thermolesion on the example of trigeminal neuralgia Trigeminal ganglion (Gasserian ganglion), after Tronnier, Lübeck, Germany

2. Treament Examples

2.1 RF Thermal Lesion on the Example of Trigeminal Neuralgia

Teststimulation

- before lesion: sensory stimulation 50 Hz, 0.1 0.4 V
- impedance measurement and motor stimulation not necessary
- below 0.4 volt, the pain should be reproducible
- X-ray monitoring and documentation

Lesion

- short-acting anaesthetic
- select temperature 70 75 °C, depending on pre-existing hypaesthesia
- common RF lesion duration 60 90 sec
- when patient is awake, neurological check by stimulation - now pain should not appear before level 1.0 V
- possibly second, more peripheral lesion without anaesthetic since pain conduction remains blocked
- X-ray monitoring and documentation

2.2 Example: Pulsed RF

This form of radiofrequency therapy differs from conventional radiofrequency treatment by the following characteristics:

- energy transmitted in short pulses instead of continuously in order to remain below tissue-coagulation heat (max. 42 °C)
- treatment is less painful for the patient
- this procedure is based on neuronal modulation of pain transmission

Works of **M. Sluijter** demonstrate beneficial and consistent results when applying following recommended settings:

40 – 60 V
2 Hz
approx. 20 msec
3 to 10 minutes
_

RF Thermolesion with LG2



LG2 Lesion Generator Art. no. 262 000

Radiofrequency Thermal Lesion with the LG2

The LG2 is a universal device for all common lesion applications in pain treatment and functional neurosurgery and meets the most exacting requirements in terms of safety, precision and comfort of use.

A large variety of instruments and devices are adaptable to the LG2. The LG2 device includes two independet RF channels, which can be used at the same time. It supports mono- or bipolar electrodes. The combination of two monopolar electrodes for a bipolar application is possible.

LG2-Features

- Continuous RF in two different modes: Temperature or Preset Temperature-Profile
- Pulsed RF in three different modes: Temperature, Voltage, RF-Duration
- Direct Nerve Stimulation for the localisation of motoric and sensoric nerves
- Continuous Impedance-measurement
- Continuous Temperature-measurement
- Touchscreen Display
- Graphic display of temperature-gradient
- Digital display of all relevant application-parameters
- Up to 30 preset parameters memorized
- Remote control

Accessories

Depending on the application, a large variety of instruments are adaptable to the LG2 for temperature-controlled RF lesions in neurosurgery and for pain therapy. Temperaturecontrolled (TC) pain electrodes and the corresponding insulated RF cannulas are commonly used. These are connected to the lesion generator together with the temperature-controlled (TC) electrodes.

Due to the insulation coating on the cannula shaft, only the exposed (non-insulated) tip of the cannula is conductive and can be used for impedance measurements, for stimulation and RF thermocoagulation. A temperature sensor in the tip of the electrode provides temperature-controlled high-frequency heating.



Lesion range with 22-gauge cannulas at various temperatures Active tip 5 mm



Lesion range with 20-gauge cannulas at various temperatures Active tip 5 mm

 Lesion temperature/°C
 65
 70
 75
 80

 Lesion diameter/mm
 2,0
 2,25
 2,75
 3,1

Technical specification for LG2

Impedance Unit

Measuring Range	30 Ω - 2 kΩ	Resolution:	1 Ω 100 Ω	30 Ω - 1 kΩ 1 kΩ - 2 kΩ
Direct Nerve Stimulation				
Motoric Stimulation Fraguency	1 Hz - 49 Hz	Resolution:	1 Hz	
Soncory Stimulation Frequency	50 Hz - 200 Hz	Resolution:	1 Hz	
Pulso Duration	50 μs - 3 ms	Min. Resolution:	50 µs	
Voltago Dango	50 mV - 10 V	Min. Resolution:	50 mV	
Current Panao	50 μA - 8 mA	Min. Resolution:	50 µA	
Current Runge	rising edge steps 0.5s/1s/2s	Min. Resolution:	50 mV [50 mV - 10 V]
Nuto Ramp			50 µA [9	50 µA - 8 mA]
Waveform	unipolar - square wave			
Neutral Split Electrode Contact Monitor	CQM (Contact Quality Monito	oring), Colour bar: gi	reen- yellow	v -red

Continuous RF

RF Control Mode	Temperature, Preset Temperatu	ıre Profile	
Lesion Temperatur.	30 °C - 95 °C	Resolution:	1 °C
Lesion Time	0 - 10 min	Resolution: 10	o sec
Monitored Temperature Accuracy	± 2 °C		
Monitored Temperature Range	20 °C - 105 °C		
Frequency	488 kHz	Sinewave	
Load Impedance Ranae	50 Ω - 2 kΩ		
Max. Output Voltage	100 Vrms		
Max. Output Current	800 mA		
Max. Nominal RF Output Power	50 W per Channel, if one Chann	el is active	
	50 W split into 2 Channel, if Cha	ı + Ch2 are active	
Stagger Time Ch1 -Ch2	0 - 120 SEC	Resolution:	1 SEC

Pulsed RF

RF Control Mode	Voltage, Pulse Duration, Temperature			
Voltage	20 V - 70 V	Resolution:	1 V	
Pulse Duration	3 ms - 40 ms	Resolution:	1 ms	
Temperature	30 °C - 95 °C	Resolution:	1 °C	
Lesion Time	30 sec - 30 min	Resolution:	30 sec	
Frequency	1 Hz - 10 Hz	Resolution:	1 Hz	



Electrodes and Fitting Cannulas for LG2 RF Cannulas and Disposable TC-Pain-Electrodes

	RF Cannulas		Disposable TC-Pain-Electrodes
Art. no.	Cannulas (10 pcs)	Art. no.	Disposbale TC-Pain-Electrodes (10 pcs)
240 100	Disposable cannula 22G x 50 x 4, isolated with mandrin	260 007	Disposable TC-Pain-Electrode 50 mm for
240 109	Disposable cannula 22G x 50 x 7, isolated with mandrin		disposable cannulas with 50 mm working length
			delivered sterile
			 Single use cable length am
240 101	Disposable cannula 226 x 100 x 2, isolated with mandrin	260.012	Disposable TC-Pain-Flectrode 100 mm for
240 101	Disposable cannula 22G x 10G x 2, isolated with mandrin	200 012	disposable cannulas with 100 mm working length
240 114	Disposable cannula 22G x 100 x 7, isolated with mandrin		delivered sterile
240 106	Disposable cannula 22G x 100 x 10, isolated with mandrin		• single use
240 152	Disposable cannula 22G x 100 x 5, curved, isolated with mandrin		• cable length 3m
240 153	Disposable cannula 22G x 100 x 10, curved, isolated with mandrin		
240 156	Disposable cannula 20G x 100 x 10, curved, sharp tip, isolated with mandrin		
240 157	Disposable cannula 20G x 100 x 10, curved, blunt tip, isolated with mandrin		
240 111	Disposable cannula 20G x 100 x 2, isolated with mandrin		
240 110	Disposable cannula 20G x 100 x 5, isolated with mandrin		
240 112	Disposable cannula 20G X 100 X 10, isolated with mandrin		
240 120	Disposable cannula 17G X 100 X 2, isolated with mandrin		
240 121	Disposable cannula $1/6 \times 100 \times 5$, isolated with manufin		
240 122	Disposable cannula 17 G x 100 x 10, isolated with mandrin		
240 103	Disposable cannula 20G x 150 x 2, isolated with mandrin	260.017	Disposable TC-Pain-Electrode 150 mm for
240 103	Disposable cannula $20G \times 150 \times 2$, isolated with mandrin	200 01/	disposable cannulas with 150 mm working length
240 105	Disposable cannula 20G x 150 x 7, isolated with mandrin		delivered sterile
240 107	Disposable cannula 20G x 150 x 15, isolated with mandrin		• single use
240 108	Disposable cannula 20G x 150 x 10, isolated with mandrin		• cable length 3m
240 154	Disposable cannula 20G x 150 x 5, curved, isolated with mandrin		
240 155	Disposable cannula 20G x 150 x 10, curved, isolated with mandrin		
240 158	Disposable cannula 20G x 150 x 10, curved, sharp tip, isolated with mandrin		
240 159	Disposable cannula 20G x 150 x 10, curved, blunt tip, isolated with mandrin	_	
240 140	Disposable cannula 18G x 115 x 2, isolated with mandrin	260 127	Disposable TC-Trigeminus-Electrode for
240 141	Disposable cannula 18G x 115 x 5, isolated with mandrin		disposable cannulas with 115 mm working length
240 142	Disposable cannula 18G x 115 x 7, isolated with mandrin		delivered sterile
240 143	Uisposable cannula 186 X 115 X 10, isolated with mandrin		single usecable length 3m

Conversion table for cannulas >> Gauge - mm

Gauge	22 G	20 G	18 G	17 G	
mm	0,7	0,9	1,2	1,4	

Connecting Cable for LG2

Art. no.	Connnecting Cable
262 008	TC cable for LG2 with 6-pole Redel connector
	grey and connector for disposable TC-Electrodes
	 delivered non sterile
	 wipe-disinfectable

Accessories for LG2

Electrodes and Fitting Cannulas for LG2

Electrodes with 4-pole SuperLight Connector and 7-pole Lemosa Plug

	SuperLight Connector		Eemosa Plug
Art. no.	Electrodes	Art. no.	Electrodes
260 006	TC pain electrode 50 mm for disposable cannula with 50 mm working length • delivered non sterile • autoclavable	260 005	TC pain electrode 50 mm for disposable cannulas with 50 mm working length • delivered non sterile • autoclavable
260 011	TC pain electrode 100 mm for disposable cannula with 100 mm working length • delivered non sterile • autoclavable	260 010	TC pain electrode 100 mm for disposable cannulas with 100 mm working length • delivered non sterile • autoclavable
260 016	TC pain electrode 150 mm for disposable cannula with 150 mm working length • delivered non sterile • autoclavable	260 015	TC pain electrode 150 mm for disposable cannulas with 150 mm working length • delivered non sterile • autoclavable
260 121	TC trigeminus electrode for disposable cannula with 115 mm working length • delivered non sterile • autoclavable	260 126	TC trigeminus electrode for disposable cannulas with 115 mm working length • delivered non sterile • autoclavable
Connecti	ing Cable for LG2		
Art. no.	Connecting Cable		TC achieve and a second

262 004	TC cable SuperLight	262 007	TC cable Lemosa	
	TC cable 3 m for LG2 with 6-pole Redel connector		TC cable 3 m for LG2 with 6-pole Redel connector	
	for TC electrodes with 4-pole SuperLight connector		for TC electrodes with 7-pole Lemosa connector	
	 delivered non sterile 		 delivered non sterile 	
	 autoclavable 		• autoclavable	

Neutral Surface Electrode for LG2

Art. no.	Neutral Surface Electrode
211 009	 Neutral surface electrode adhesive for monopolar stimulation and coagulation applications Single use
262 012	Neutral surface split electrode adhesive for monopolar stimulation and coagulation applications, contact impedance is permanently checked by LG2 • Single use
262 002	Neutral cable Cable 3 m for LG2 with 2-pole connector and clip flat male connector for neutral surface electrodes (art. no. 211 009) • non-autoclavable

Additional Accessories for LG2

Art. no.	Remote Control
262 001	Remote control
	Cable 2,5 m for LG2 with Redel connector grey 4-pole, including 4 keys to control the LG2
	• non-autoclavable

262 003 *Termination connector*

Connector to terminate RF channels during selftest

262300	Trolley for LG2	
	incl Silicone Device Base	

incl. Silicone Device Base with 4 wheels, front wheels with brakes

262301 Silicone Device Base for LG2

262 302 *Transport case for LG2*











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Contact

First name, surname	
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Art. No.	Qty.	Description	Quote request	Order placement
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