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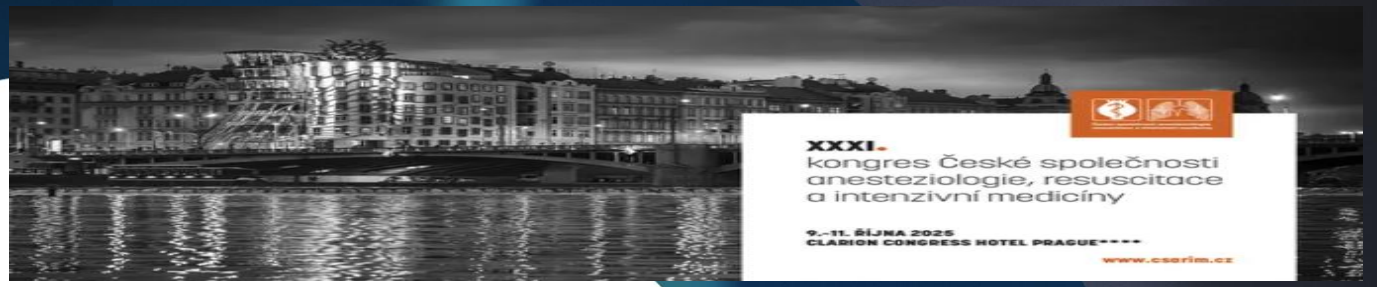
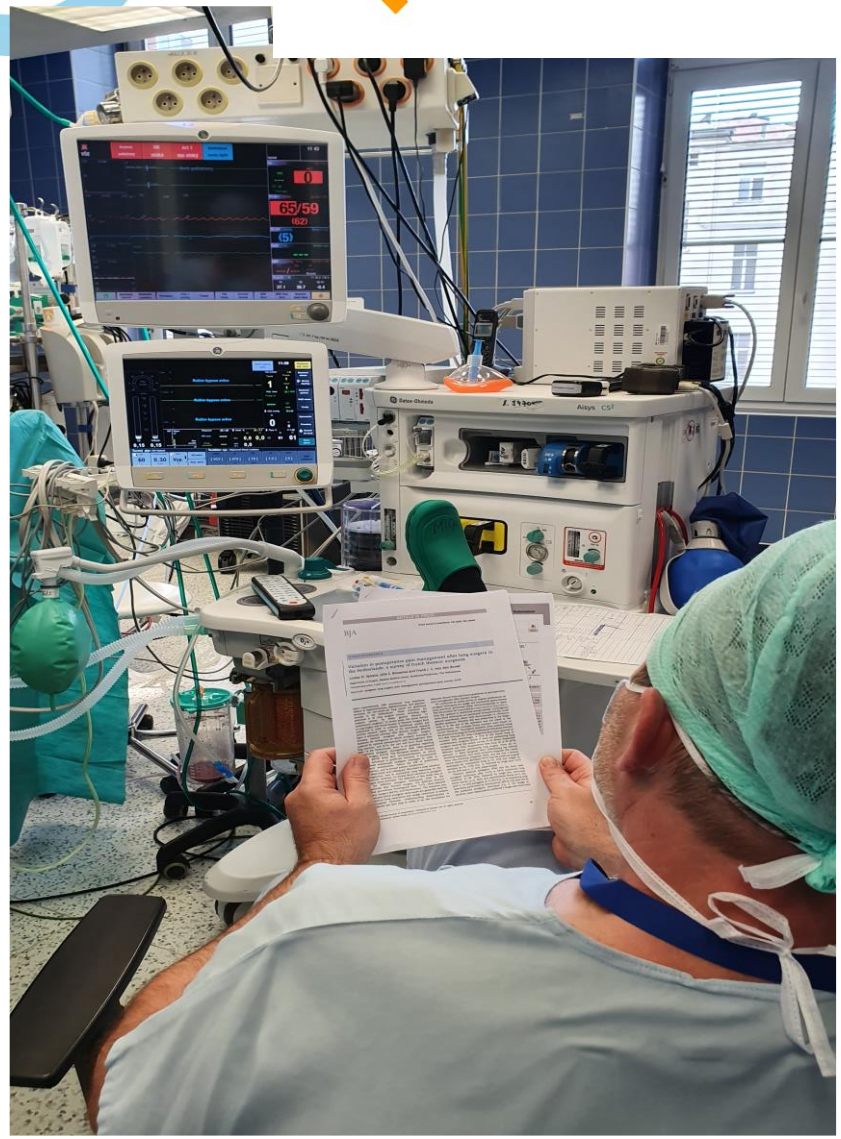


MODULACE SYMPATIKU PŘI ARYTMOGENNÍCH BOUŘÍCH A REFRAKTERNÍ ANGINĚ PECTORIS

Pavel Michálek
KARIM 1.LF UK a VFN Praha



DEKLARACE O STŘETU ZÁJMU

Pavel Michálek nemá žádný střet zájmů v souvislosti s touto přednáškou

x

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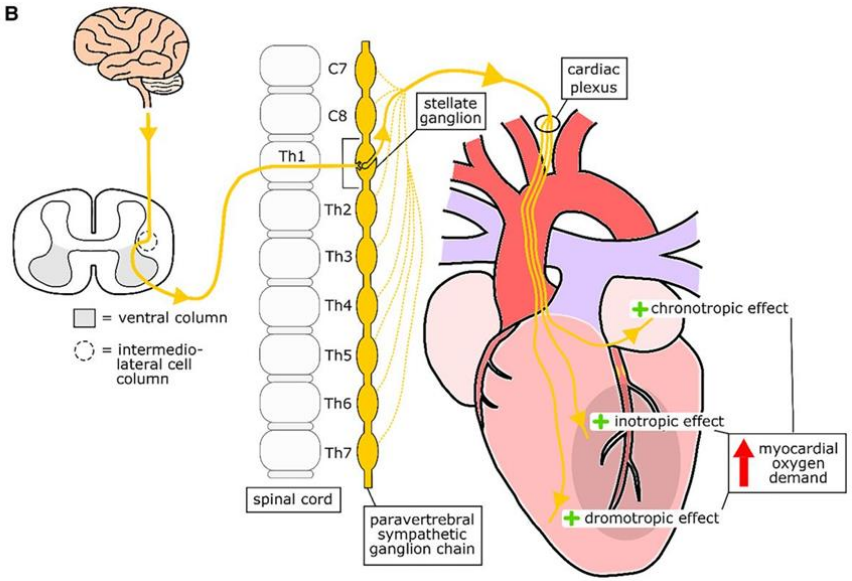
KDE JE ROLE INTERVENČNĚ ALGEZIOLOGICKÝCH METOD V KARDIOLOGII?

- Modulace sympatiku
- Arytmogenní bouře
- Refrakterní angina pectoris
- Srdeční selhání



ESC European Society of Cardiology

European Heart Journal (2024) **45**, 823–833
https://doi.org/10.1093/eurheartj/ehae021

FASTTRACK CLINICAL RESEARCH
Arrhythmias

Electrical storm treatment by percutaneous stellate ganglion block: the STAR study

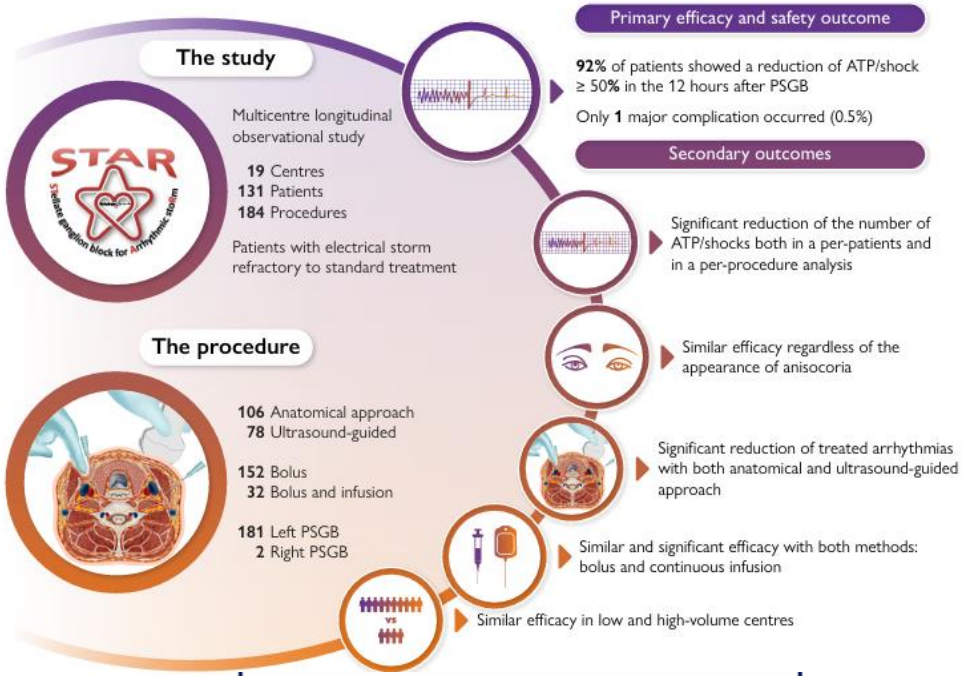
Simone Savastano [1]*, Enrico Baldi [1], Sara Compagnoni[1,2], Roberto Rordorf [1], Antonio Sanzo[1], Francesca Romana Gentile[1,2], Veronica Dusi [3,4], Simone Frea[3,4], Carol Gravinese[3,4], Filippo Maria Cauti[5], Gianmarco Iannopollo[6], Francesco De Sensi [7], Edoardo Gandolfi[8], Laura Frigerio[8,9], Pasquale Crea[10], Domenico Zagari[11], Matteo Casula [12], Giuseppe Sangiorgi[13], Simone Persampieri[14], Gabriele Dell'Era[15], Giuseppe Patti [15,16], Claudia Colombo[17], Giacomo Mugnai[18], Francesco Notaristefano [19], Alberto Barengo[19], Roberta Falcetti[20], Giovanni Battista Perego[21], Giuseppe D'Angelo[22], Nikita Tanese[22], Alessia Currao[1], Vito Sgromo[23], and Gaetano Maria De Ferrari [3,4]; the STAR study group

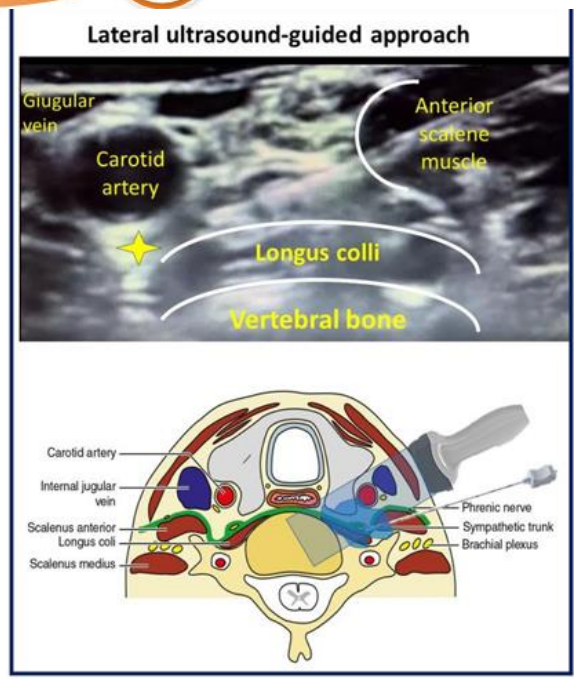
Abstract

Background and Aims An electrical storm (ES) is a clinical emergency with a paucity of established treatment options. Despite initial encouraging reports about the safety and effectiveness of percutaneous stellate ganglion block (PSGB), many questions remained unsettled and evidence from a prospective multicentre study was still lacking. For these purposes, the STAR study was designed.

Methods This is a multicentre observational study enrolling patients suffering from an ES refractory to standard treatment from 1 July 2017 to 30 June 2023. The primary outcome was the reduction of treated arrhythmic events by at least 50% comparing the 12 h following PSGB with the 12 h before the procedure. STAR operators were specifically trained to both the anterior anatomical and the lateral ultrasound-guided approach.

Results A total of 131 patients from 19 centres were enrolled and underwent 184 PSGBs. Patients were mainly male (83.2%) with a median age of 68 (63.8–69.2) years and a depressed left ventricular ejection fraction (25.0 ± 12.3%). The primary outcome was reached in 92% of patients, and the median reduction of arrhythmic episodes between 12 h before and after PSGB was 100% (interquartile range −100% to −92.3%). Arrhythmic episodes requiring treatment were significantly reduced comparing 12 h before the first PSGB with 12 h after the last procedure [six (3–15.8) vs. 0 (0–1), $P < .0001$] and comparing 1 h before with 1 h after each procedure [2 (0–6) vs. 0 (0–0), $P < .001$]. One major complication occurred (0.5%).





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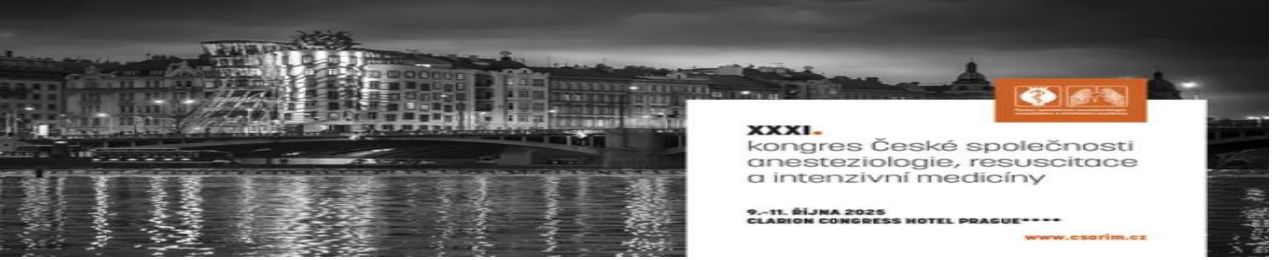
RF horní hrudní sympatektomie v léčbě refrakterních komorových arytmií

- Opakované kasuistiky, že chirurgická hrudní sympatektomie může zvrátit VT ve střednědobém až dlouhodobém horizontu *(Lloyd, Circulation 1974)*.
- Opakované kasuistiky, že VATSY může zvrátit VT ve střednědobém až dlouhodobém horizontu *(Moray, HLC 2011)*.
- Oba výkony efektivní – ALE – zatěžují celkovou anestezii, nutností selektivní ventilace se všemi jejími oběhovými důsledky



Radiofrekvenční denervace hrudního sympatiku – nová možnost v léčbě ischemických stavů horních končetin

Pavel Michálek, Tomáš Gabrhelík*, Libor Doleček, Petr Štádler**, Pavel Šebesta**, Karel Roztočil***

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Michálek P, Gabrhelík T*, Doleček L, Štádler P**, Šebesta P**, Roztočil K*** (Úsek kardiovaskulární anestezie a intenzivní péče, Nemocnice Na Homolce, Praha, *Klinika anesteziologie a resuscitace, Fakultní nemocnice Olomouc a Lékařská fakulta Univerzity Palackého, Olomouc, **Oddělení cévní a rekonstrukční chirurgie, Nemocnice Na Homolce, Praha, ***Klinika kardiologie, Institut klinické a experimentální medicíny, Praha, Česká republika). **Radiofrekvenční denervace hrudního sympatiku – nová možnost v léčbě ischemických stavů horních končetin.** *Cor Vasa 2007;49(1):13–18.*

Cíl: Cílem této pilotní studie bylo ověřit úspěšnost perkutánní radiofrekvenční termokoagulace při léčbě ischemických stavů horních končetin.
Metodika: U indikovaných pacientů byla provedena termokoagulace horního hrudního sympatiku pomocí kontrolované léze v úrovni Th2 a Th3. Byla sledována úspěšnost výkonu pomocí subjektivních i objektivních kritérií a frekvence komplikací. Celkem byl ve sledovaném období proveden výkon u 20 pacientů.
Výsledky: Akutní úspěšnost metody byla v našem souboru 90%. K rekurenci ischemických obtíží došlo u 28 % nemocných. Po 24 měsících byl výrazný účinek výkonu patrný ještě u 75 % pacientů. Úmrtí v souvislosti s výkonem ani závažné komplikace nebyly zaznamenány. Z méně závažných komplikací se vyskytly přechodně bolesti v zádech a otok horní končetiny následkem reperfuze.
Závěry: Perkutánní radiofrekvenční koagulace v našem souboru ukázala statisticky významné zlepšení prokrvení horní končetiny, snížení četnosti ischemické bolesti při současně nízké frekvenci komplikací. Další studie jsou nezbytné pro potvrzení tohoto výsledku.
Klíčová slova: Ischemie horní končetiny – Radiofrekvenční termoléze – Horní hrudní sympatikus

Michálek P, Gabrhelík T*, Doleček L, Štádler P**, Šebesta P**, Roztočil K*** (Division of Cardiovascular Anesthesia and Intensive Care, Na Homolce Hospital, Prague, *Department of Anesthesiology and Resuscitation, Olomouc University Hospital and Palacký University Medical School, Olomouc, **Department of Vascular and Reconstructive Surgery, Na Homolce Hospital, Prague, ***Department of Cardiology, Institute for Clinical and Experimental Medicine, Prague, Czech Republic). **Radiofrequency thoracic sympathetic denervation—a new option in the treatment of ischemic upper limb conditions.** *Cor Vasa 2007;49(1):13–18.*

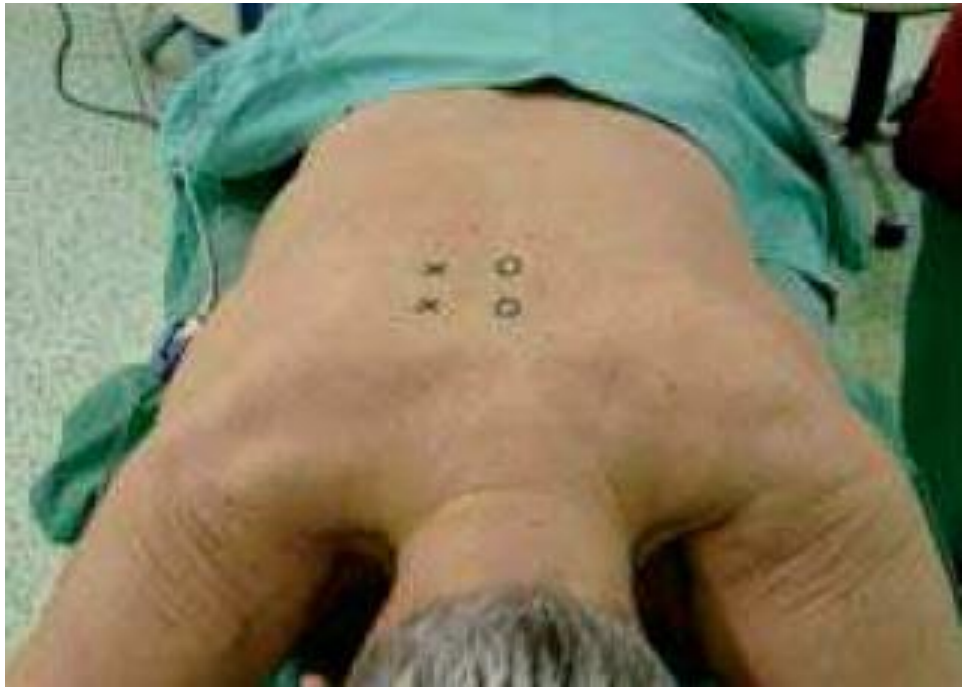
Percutaneous Upper Thoracic Radiofrequency Sympathectomy in Raynaud Phenomenon

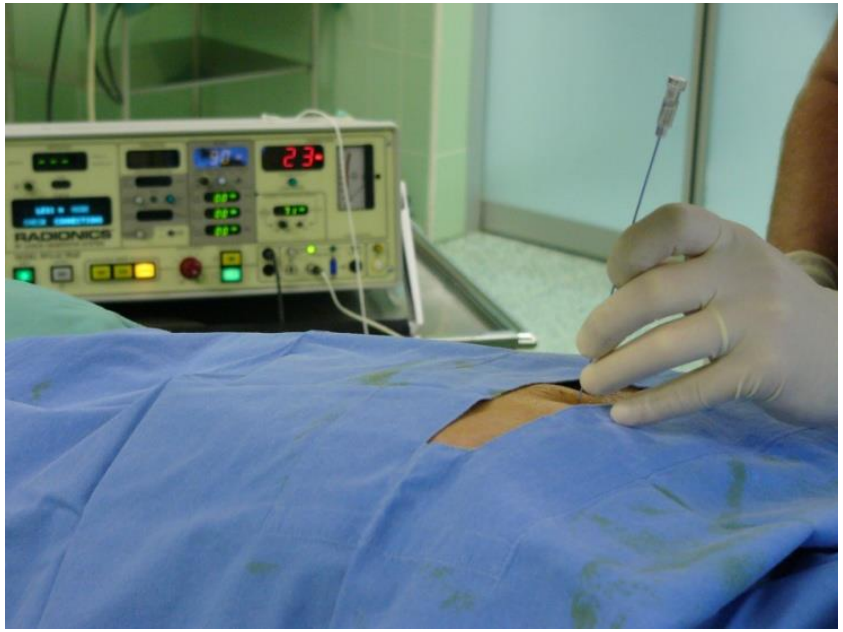
A Comparison of T2/T3 Procedure Versus T2 Lesion With Phenol Application

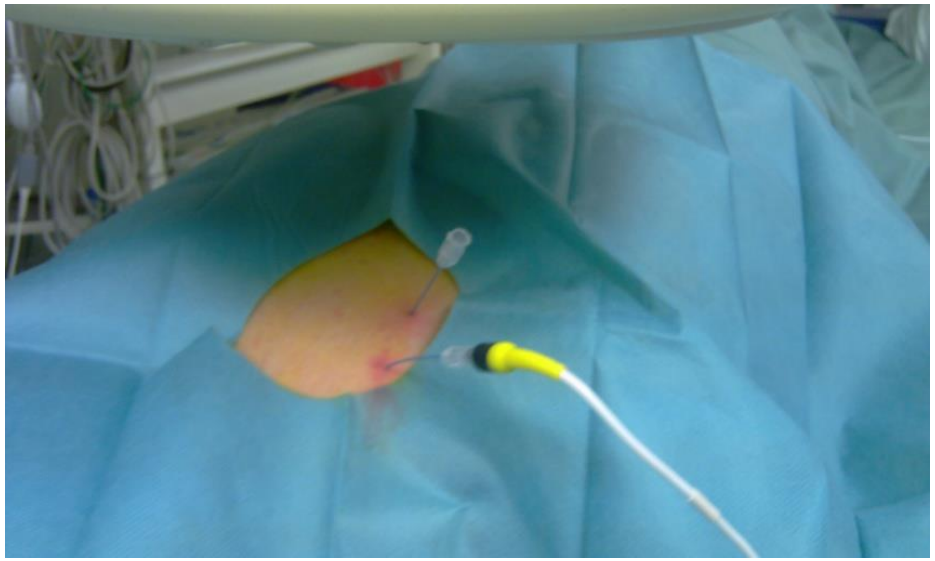
Tomas Gabrhelik, MD, PhD, Pavel Michalek, MD, PhD, DESA,† Milan Adamus, MD, PhD,* and Emil Berta, MD**

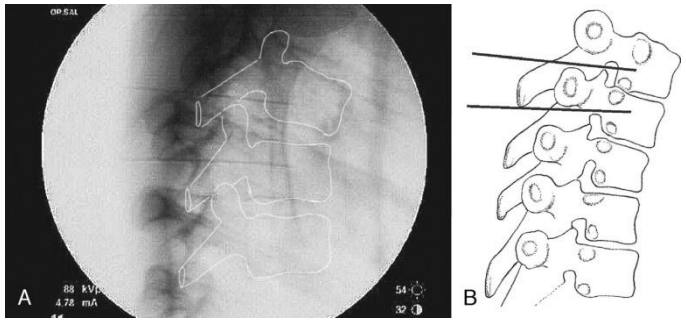
Background and Objectives: Percutaneous radiofrequency (RF) thoracic sympathectomy is an alternative method to surgical procedures for the treatment of acral ischemia in Raynaud phenomenon. The procedure is indicated if conservative therapy fails to provide sufficient relief. The aim of this study was to compare classic T2 and T3 RF thermolesioning with a less invasive procedure at the level of T2 only.
Methods: Fifty adult patients, American Society of Anesthesiologists (ASA) classification I to III, were randomly assigned to 1 of 2 groups. T2 and T3 thoracic RF thermolesion was performed in 1 group, whereas T2 thermolesion with local application of 0.5 mL of 6% phenol was delivered in the second group. Changes in cold perception, pain, and quality of life were assessed using a questionnaire. Blood circulation in the upper extremity was evaluated using infrared thermography. Patients were observed for a period of 3 months.
Results: A significant decrease in pain according to visual analog scale ($P < 0.001$), increase in peripheral temperature in the upper extremities ($P < 0.001$), and improvement in quality of life were observed in both groups of patients after the procedure. Susceptibility to cold-provoked vasospasm was not significantly affected in either group. There was no significant difference between the 2 groups in any parameter apart from the duration of the procedure.
Conclusions: Thoracic RF upper sympathectomy is an effective method in the treatment of resistant forms of Raynaud phenomenon. A single-shot procedure at the level of T2 may be preferable because of the shorter procedure duration of this technique.

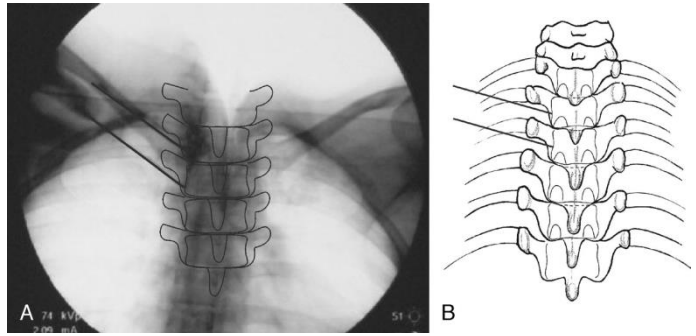
(*Reg Anesth Pain Med* 2009;34: 425–429)




RADIONICS




A
B


A
B

- Kazuistiky 22 pacientů v NNH a VFN
- refrakterní VT, dilatační KMP – 8x
- komorové bouře bez arytmogenního substrátu – 11x
- refrakterní VT při dysplazii PKS – 1x
- refrakterní arytmogenní bouře po AIM – 2x

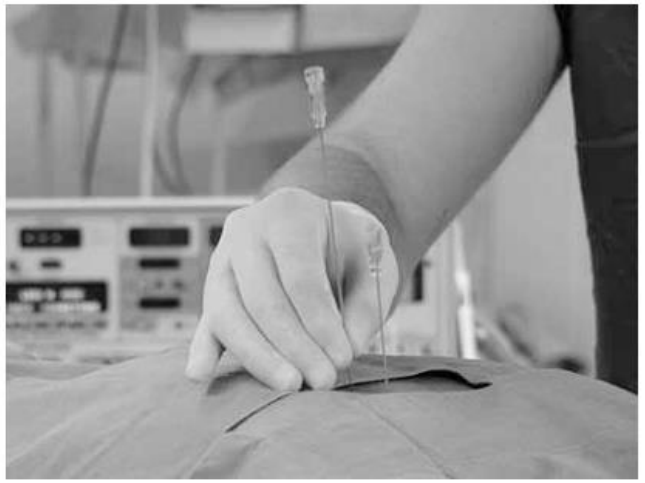
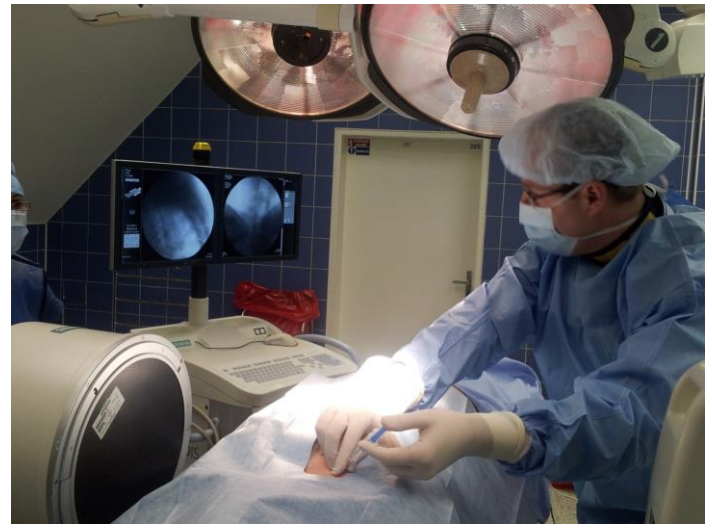


Figure 1.—Two RF-cannulae inserted at the levels of T2 and T3.



Percutaneous radiofrequency left cardiac sympathetic denervation for refractory ventricular arrhythmogenic storms: a report of three cases

M. DOBIAS [1], P. MICHALEK [1], P. NEUZIL [2], P. OSTADAL [2]

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MINERVA ANESTESIOLOGICA

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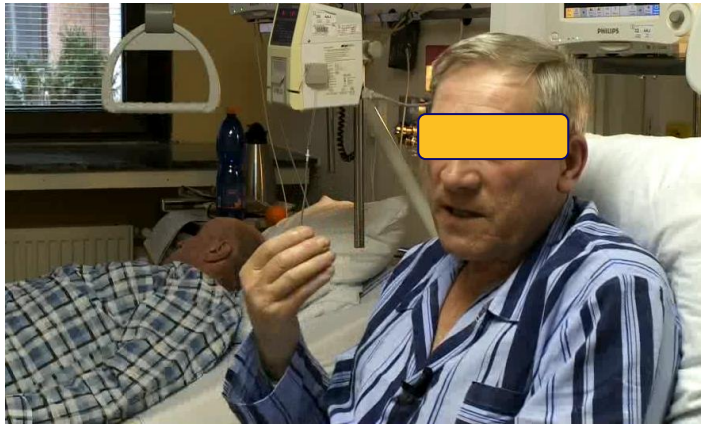
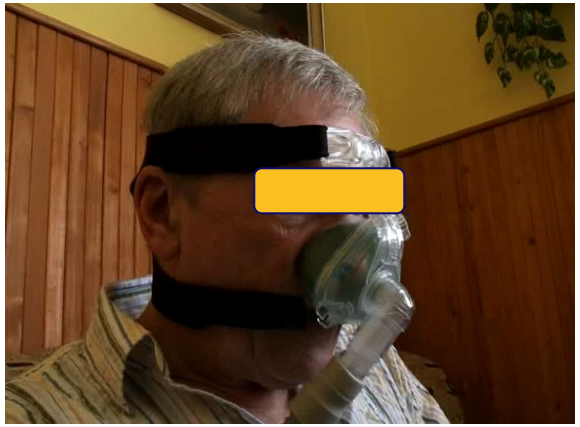
Refrakterní angina pectoris

- Charakterizována perzistující bolestí na hrudi nebo diskomfortem rezistentními na konvenční léčbu ICHS - nitráty, beta-blokátory, Ca2+ blokátory
- Perzistující bolest na hrudi navzdory CABG, PCI
  - *(Mannheimer et al., Eur Heart J 2002; Bhatt and Stone, Curr Opin Cardiol 2006)*
- Postihuje 600 000-1,800 000 lidí v USA, 50 000 nových případů ročně *(Bhatt and Stone, Curr Opin Cardiol 2006; Kiernan et al., Am J Cardiol 2007)*
- 30 000-50 000 nových pacienů v kontinentální Evropě ročně *(Mannheimer et al., Eur Heart J 2002)*





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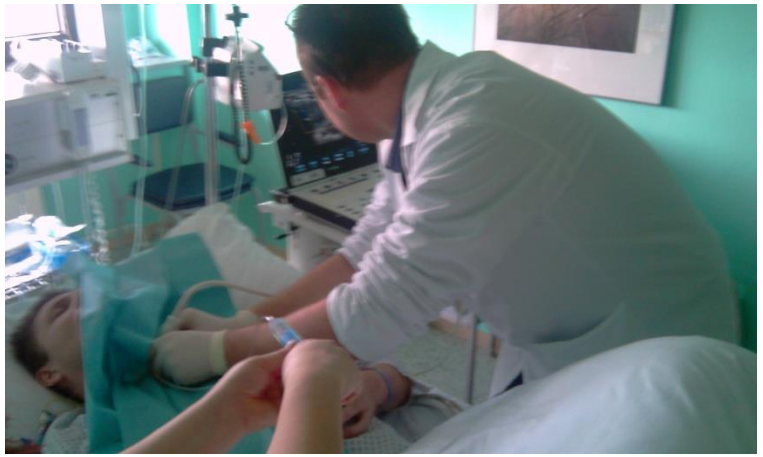
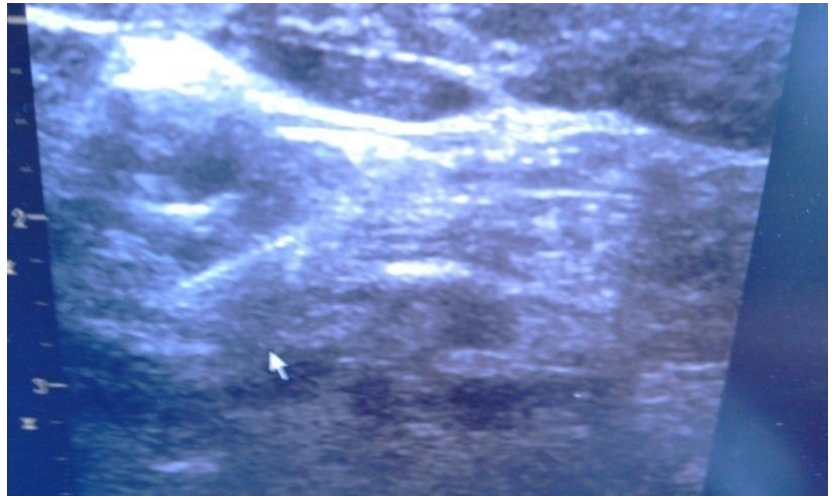
Ovlivnění sympatiku v léčbě refrakterní anginy pectoris



- Opakované blokády g. stellatum *(Moore et al., J Pain Symptom Manage 2005, Chester, Pain 2000)*, RF denervace a neurolytické výkony na g. stellatum
- Přerušení hrudního sympatiku chirurgickou cestou *(Jonnesco, 1924)*
- Videotorakoskopická horní hrudní sympatektomie *(Tygesen et al., Am J Cardiol 1997, Stritesky et al., Interact Cardiovasc Thorac Surg 2006)*
- RF termoléze horního hrudního sympatiku, nepopsána v léčbě RAP *(Wilkinson, Neurosurgery 1996; Wilkinson, Neurosurg Quart 2002)*



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Biomed Pap Med Fac Univ Palacky Olomouc Czech Repub. 2014 Dec; 158(4):518-527.

Interventional treatment of pain in refractory angina. A review

Milos Dobias[a], Pavel Michalek[a], Petr Neuzil[b], Martin Stritesky[a], Paul Johnston[c]

Background. Refractory angina is characterized by repeated attacks of chest pain in patients on maximal anti-anginal pharmacotherapy, with a professional conscensus that further surgical or radiological revascularization would be futile. Refractory angina is a serious but relatively uncommon health problem, with a reported incidence of approximately 30 patients per million people/year. In this condition simply treating the associated pain alone is important as this can improve exercise tolerance and quality of life.
Methods. An extensive literature search using five different medical databases was performed and from this, eighty-three papers were considered appropriate to include within this review.
Results and Conclusion. Available literature highlights several methods of interventional pain treatment, including spinal cord stimulation and video-assisted upper thoracic sympathectomy which can provide good analgesia whilst improving physical activities and quality of life. The positive effect of spinal cord stimulation on the intensity of pain and quality of life has been confirmed in nine randomized controlled trials. Other potential treatment methods include stellate ganglion blocks, insertion of thoracic epidural or spinal catheters and transcutaneous electrical nerve stimulation. These approaches however appear more useful for diagnostic purposes and perhaps as short-term treatment measures.

Key words: refractory angina, spinal cord stimulation, thoracic sympathectomy, stellate ganglion

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http://dx.doi.org/10.5507/bp.2014.028

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Corresponding author: Pavel Michalek, e-mail: pavel.michalek@vfn.cz

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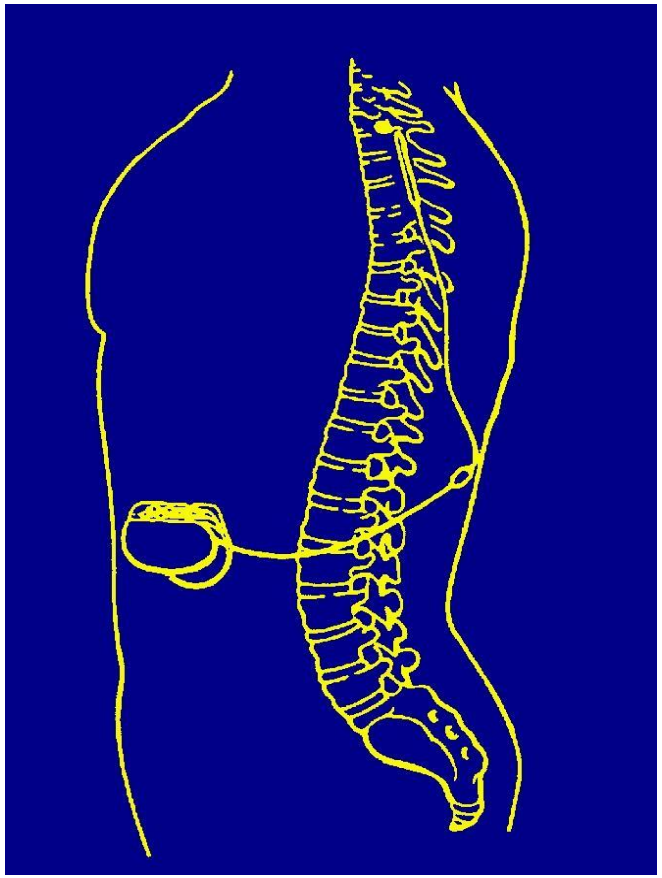
Míšní stimulace



BMC Cardiovascular Disorders

BioMed Central

Research article

Open Access

Spinal cord stimulation in the treatment of refractory angina: systematic review and meta-analysis of randomised controlled trials

Rod S Taylor*[1], Jessica De Vries[2], Eric Buchser[3] and Mike JL DeJongste[2]

Abstract

Background: The aim of this paper was undertake a systematic review and meta-analysis of the use of spinal cord stimulation (SCS) in the management of refractory angina.

Methods: We searched a number of electronic databases including Medline, Embase and Cochrane Library up to February 2008 to identify randomised controlled trials (RCTs) reporting exercise capacity, ischemic burden, functional class, quality of life, usage of anti-anginal medication, costs and adverse events including mortality. Results were reported both descriptively for each study and using random effects meta-analysis. Given the variety in outcomes reported, some outcome results were pooled as standardised mean differences (SMD) and reported in standard deviation units.

Results: Seven RCTs were identified in a total of 270 refractory angina patients. The outcomes of SCS were found to be similar when directly compared to coronary artery bypass grafting (CABG) and percutaneous myocardial laser revascularisation (PMR). Compared to a 'no stimulation' control, there was some evidence of improvement in all outcomes following SCS implantation with significant gains observed in pooled exercise capacity (SMD: 0.76, 0.07 to 1.46, $p = 0.03$) and health-related quality of life (SMD: 0.83, 95% CI: 0.32 to 1.34, $p = 0.001$). Trials were small and were judged to range considerably in their quality. The healthcare costs of SCS appeared to be lower than CABG at 2-years follow up.

Conclusion: SCS appears to be an effective and safe treatment option in the management of refractory angina patients and of similar efficacy and safety to PMR, a potential alternative treatment. Further high quality RCT and cost effectiveness evidence is needed before SCS can be accepted as a routine treatment for refractory angina.

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INTERVENTIONAL CARDIOLOGY

VIA MEDICA

RESEARCH LETTER

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Spinal cord stimulation in the treatment of refractory angina pectoris: 25-year clinical experience at a single center

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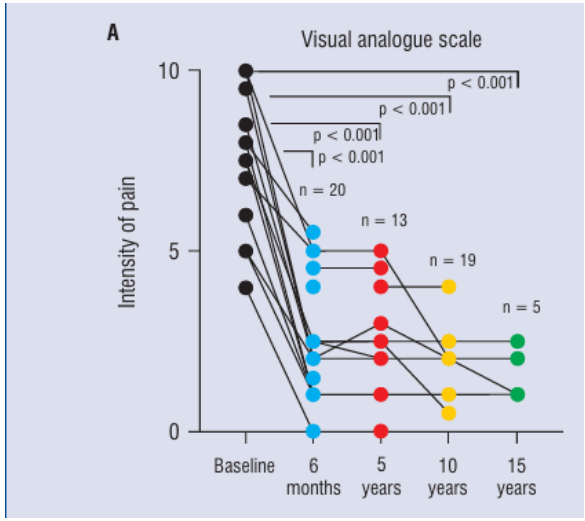
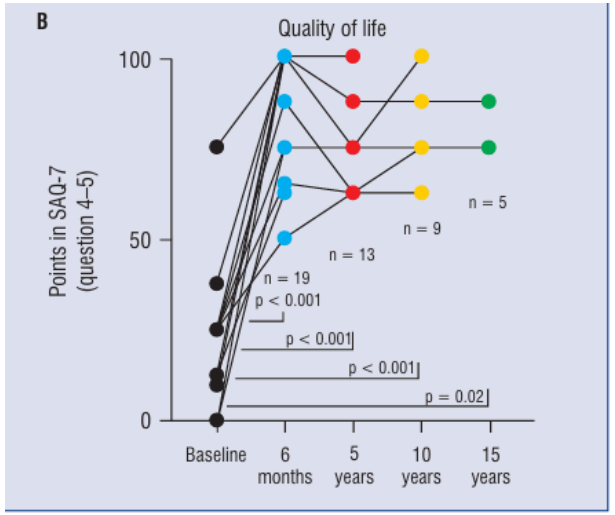
[2]Department of Stereotactic and Radiation Neurosurgery, Na Homolce Hospital, Prague, Czech Republic
[3]Department of Anesthesiology and Intensive Care, General University Hospital, Prague, Czech Republic

Clinical outcomes (before and 6 months after implantation)	
CCS angina pectoris scale (I/II/III/IV), n [%]; n = 43	0/0/26/17 (0/0/60.5/39.5) / / 11/27/3/2 (25.6/62.8/7.0/4.7), p < 0.001
Visual analog scale of pain, points; n = 20	7.4 ± 1.7 / 2.5 ± 1.5, p < 0.001
SAQ-7 summary score, points; n = 19	25.3 ± 12.3 / 81.9 ± 13.2, p < 0.001
Physical limitation, points; n = 19	28.9 ± 17.9 / 77.6 ± 18.3, p < 0.001
Angina frequency, points; n = 20	25.5 ± 17.1 / 77.0 ± 11.9,p < 0.001
Quality of life, points; n = 19	23.6 ± 16.6 / 82.4 ± 17.7,p < 0.001
Long-acting nitrate, n [%]; n = 43	37 (86.0) / 33 (76,7), p = 0.046

CCS — Canadian Cardiovascular Society; ICD — implantable cardioverter-defibrillator; SAQ-7 — short version of Seattle Angina Questionnaire; values are expressed as mean ± standard deviation or number (%); physical limitation, angina frequency and quality of life are deri from SAQ-7





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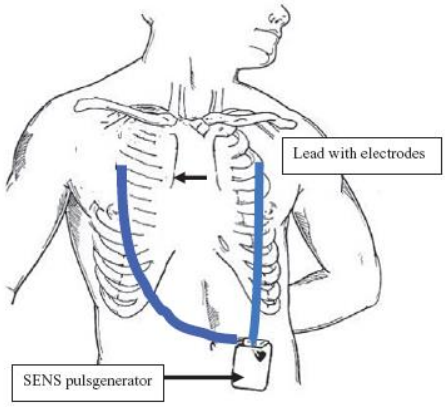
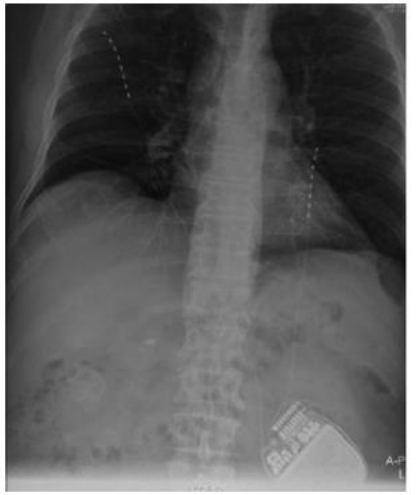
Další možnosti modulace

- SENS - 7 pts s RAP. Zlepšení QOL, tolerance fyzické zátěže, záchvatů anginy *(Buiten et al., Neuromodulation 2011),* efektivní náhrada za SCS u některých pacientů *(Goroszeniuk, osobní komunikace)*
- TENS – přechodný pozitivní účinek, trial před SCS *(De Vries et al., BMC Cardiovasc Dis 2007; Sanderson et al., Coron Artery Dis 1996)*
- Hrudní epidurální analgézie doma – 37 pacientů *(Richter et al., J Cardioth Vasc Anesth 2002)* a 152 pacientů *(Richter et al., J Cardioth Vasc Anesth 2012)*
- Intrathékální opioidy, implantované pumpy *(Segal et al., Neurosurgery 1996, Cherry et al., Pain 2003)*





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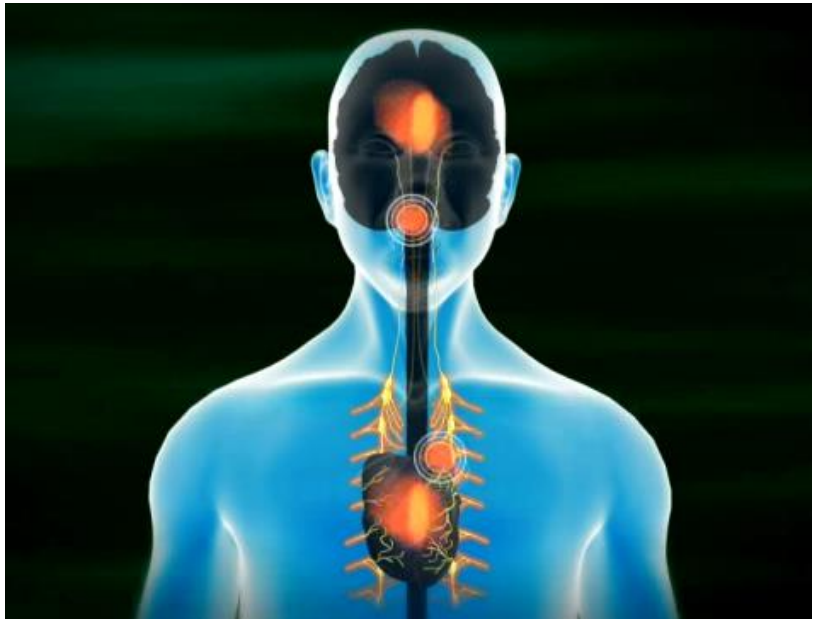

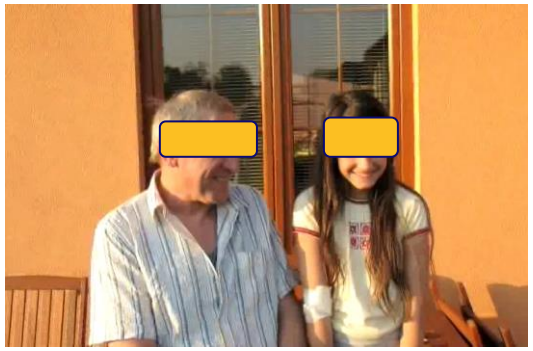

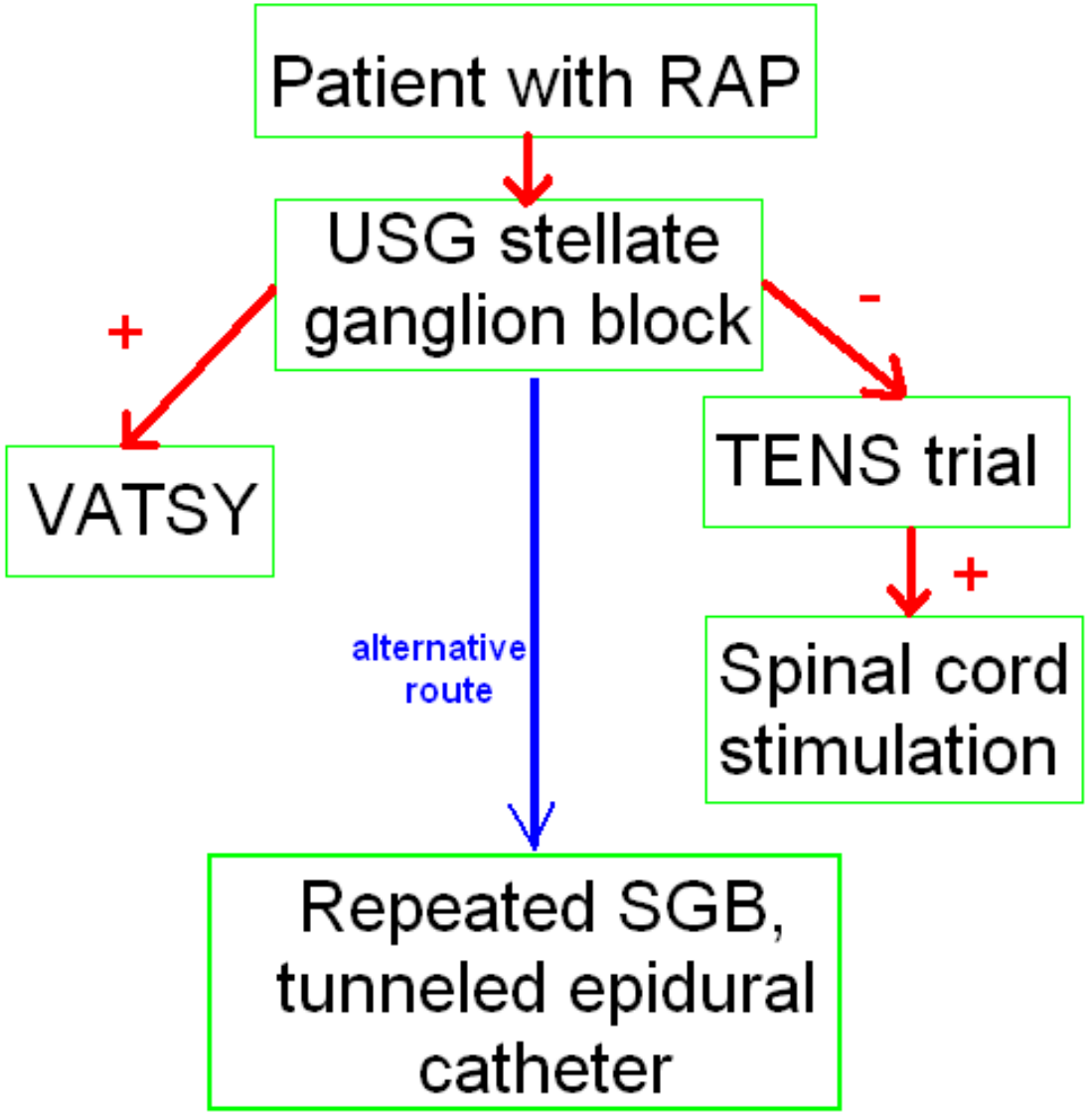

GENERAL UNIVERSITY HOSPITAL IN PRAGUE

NEMOCNICE NA HOMOLCE

FIRST FACULTY OF MEDICINE Charles University

INTERVENTIONAL PAIN MANAGEMENT IN REFRACTORY ANGINA – LONG-TERM PRAGUE EXPERIENCE

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INTRODUCTION:

Refractory angina (RAP) is a chronic condition with recurring attacks of chest pain with no further revascularization feasible. Complex care in refractory angina includes interventional pain management techniques. They can be divided to spinal cord stimulation (SCS), subcutaneous electrical nerve stimulation (SENS), transcutaneous stimulation (TENS), sympathetic blocks, and neuraxial blocks.

METHODS:

We describe more than 25 years of experience in RAP interventional pain management in two tertiary Prague hospitals. One center applied a treatment algorithm consisting of the sympathetic block, thoracic sympathectomy, and in non-responders, spinal cord stimulation. The second center performed primarily the implantation of spinal cord stimulators. The following parameters were evaluated in regular intervals: the CCS angina scale, the incidence of attacks, Visual Analog Scale of pain, physical limitation, and the quality of life. This retrospective cohort study was considered as the service evaluation and therefore the Ethical Committee approval was waived.

RESULTS:

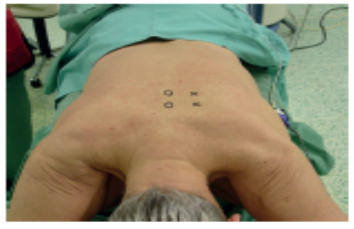
The cohort includes 85 patients (71 males, 83.5%). 49 patients (57.6%) underwent SCS, while 17 (20%) had left-sided thoracoscopic or radiofrequency thoracic T2, T3 sympathectomy. Thirteen patients (15.3%) were managed with repeated stellate ganglion blocks and refused further escalation of interventional therapy. The remaining subjects received only stellate ganglion block with no effect. SCS patients reported a statistically significant reduction in pain intensity, nitrate usage, and improvement in the quality of life. Similar results were achieved in RF sympathectomy, however, its effect was shorter. There was no periprocedural death and complications are summarized in Table 1. Twenty-nine patients (34.1%) died during the follow-up for various reasons. The total follow-up time was 610 patient years.

CONCLUSION:

Although SCS is the preferred interventional pain management technique in refractory angina pain, RF upper thoracic sympathectomy may be considered in patients positively responding to the stellate ganglion block.

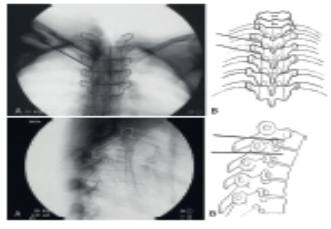
Method of intervention	Complications	
Spinal cord stimulation (n=49)	Lead dislocation or damage Pocket site infection Spinal canal hematoma, infection	7 (14.3%) 4 (8.2) 0
RF thoracic sympathectomy (n=10)	Transient bradycardia/asystoly Intercostal neuritis	1 (10%) 1 (10%)
Video-assisted thoracoscopic sympathectomy (n=7)	Neuropathic chest or arm pain	3 (42.9)
Stellate ganglion block (n=13)	Transient ischemic attack Symptoms of local anesthetic toxicity	1 (7.7%) 1 (7.7%)

Table 1. Complications associated with the interventional procedures

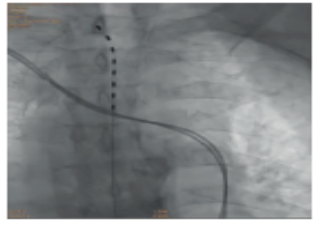


Positioning of the patient and landmarks for T2, T3 radiofrequency sympathectomy

Placement of the needles using the „tunnel vision technique" under fluoroscopy



Dye distribution confirming correct placement of the needles in T2, T3 radiofrequency sympathectomy



Lead positioning at the level of upper thoracic spine for the spinal cord stimulation in refractory angina

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Disclosures:

P. Neuzil has received speaker's honorarium from Medtronic Plc and St. Jude Medical Inc. All other authors declare no conflict of interest.

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Determining the Feasibility of Spinal Cord Neuromodulation for the Treatment of Chronic Systolic Heart Failure

The DEFEAT-HF Study

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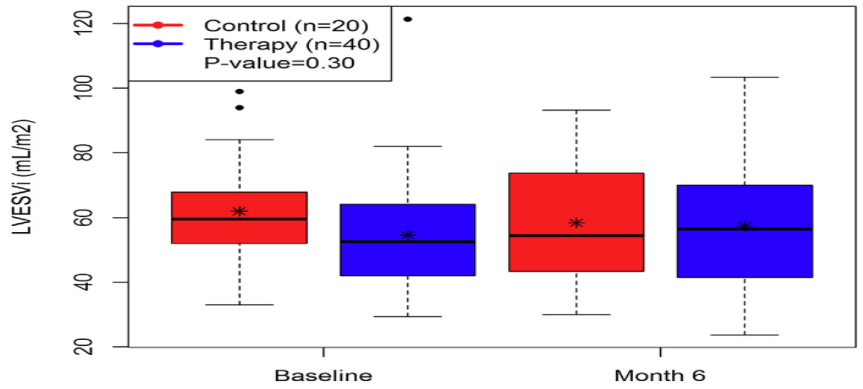
FIGURE 3 Change in LVESVi at 6 Months



The **bottom line of the box** equals the 25th percentile, the **top line** equals the 75th percentile, the **line within the box** equals the median, and the **asterisk** equals the mean. Sixty-two patients completed a 6-month visit, but 2 echoes were unreadable and excluded, leaving 40 spinal cord stimulation (SCS) ON patients and 20 SCS OFF patients contributing to the primary endpoint. LVESVi = left ventricular end-systolic volume index.

ABSTRACT

OBJECTIVES The primary objective of the study was a change in left ventricular end-systolic volume index (LVESVi) from baseline to 6 months of spinal cord stimulation (SCS) therapy in the treatment arm compared to the control arm as measured by echocardiography. Secondary objectives were changes in peak oxygen uptake and N-terminal pro-B-type natriuretic peptide (NT-proBNP) between the treatment arm and control arm from baseline through 6 months.

BACKGROUND Abnormal neurohormonal activation is often responsible for progression of heart failure (HF). Treatment has often included drug therapy to modulate the neurohormonal axis. The purpose of the DEFEAT-HF (Determining the Feasibility of Spinal Cord Neuromodulation for the Treatment of Chronic Heart Failure) clinical study was to evaluate whether direct modulation of the nervous system through SCS improved HF metrics, including heart size, biomarkers, functional capacity, and symptoms.

METHODS The DEFEAT-HF study was a prospective, multicenter randomized (3:2), parallel, single-blind, controlled study to investigate whether SCS was a feasible therapy for the treatment of systolic HF for patients with New York Heart Association functional class III HF, left ventricular ejection fraction (LVEF) ≤35%, QRS duration <120 ms, and left ventricular end-diastolic dimension ≥55 mm. The primary objective of the DEFEAT-HF study was to evaluate the reduction in LVESVi after 6 months of SCS therapy in the treatment arm compared to the control arm.

RESULTS In total, 81 patients were enrolled, with 66 successfully randomized and implanted with the SCS device system. Seventy-six percent (50 of 66) had an implantable cardioverter-defibrillator at the baseline visit. Among randomized patients, the mean age was 61 years, 79% were male, mean LVEF was 27%, and mean QRS duration was 105 ms. The change in LVESVi over 6 months was not significantly different between randomization arms (SCS OFF: -2.2 [95% confidence interval: -9.1 to 4.6] vs. SCS ON: 2.1 [95% confidence interval: -2.7 to 6.9]; p = 0.30). Analyses of secondary endpoints for the study were also not significantly different.

CONCLUSIONS The present study does not provide evidence to support a meaningful change in clinical outcomes for HF patients receiving SCS. (Determining the Feasibility of Spinal Cord Neuromodulation for the Treatment of Chronic Heart Failure [DEFEAT-HF]; NCT01112579) (J Am Coll Cardiol HF 2016;4:129–36) © 2016 by the American College of Cardiology Foundation.

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KARIM

Kazuistika

- *Pacientka, ročník 1962, v CLB od 8/15, dg. RAP, stp CABG + PCI 2x, syndrom X*
- *1/16 – SGB s výborným efektem*
- *11/16 – RF-TSE vlevo, efekt velmi dobrý, efekt 18m*
- *4/18 – re-RF-TSE vlevo, efekt dobrý, neuropatie interkostobrachiálního nervu*
- *6/21 – re-RF-TSE vlevo, efekt dobrý, 11/22- re-RF-TSE vlevo, při výkonu bradykardie 30/min*
- *10/23 - re-RF-TSE vlevo, výkon ukončen pro asystolii, atropin, 10 mcg adrenalinu*
- *5/24 – implantace SCS stimulátoru, stimlace Th1-Th4, efekt ++*