

# **Transcutaneous Electrical Nerve Stimulation Used to Select Patients for Treatment with Spinal Cord Stimulation in Intractable Angina Pectoris.**

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Spinal cord stimulation (SCS) has been used at the Odense University Hospital , Denmark since 1988. From October 1992 Transcutaneous Electrical Nerve Stimulation (TENS) has been used to select patients with intractable angina for treatment with SCS.

## **Material:**

Patients are referred after evaluation by cardiologists. Maximum antianginal treatment and revascularisation have been tried without success. In Denmark usually these patients are in this situation often treated with opioids, and many patients are addicted to opioid at the time of the referral.

## **Aim of treatment with TENS:**

The main problem using SCS for angina is the difficulties in identifying a patient population, in whom long term pain control may be achieved. Using TENS we can reduce and control angina pectoris and there by selecting patients for later SCS.

## **Method:**

### **First meeting:**

The patient have to fill in a painfile concerning pain location, severity and numbers of attack, antianginal medication and opioid consumption prior to treatment with TENS. At the first meeting we discuss and registrate these issues.

TENS is used both prophylactic and in the treatment of angina attacks.

TENS with low power is tested at rest (prophylactic treatment) and the patient is instructed in using the device with the electrodes placed over the angina area.

An angina attack is then provoked and TENS with high power is used as a painkiller.

### **Diary:**

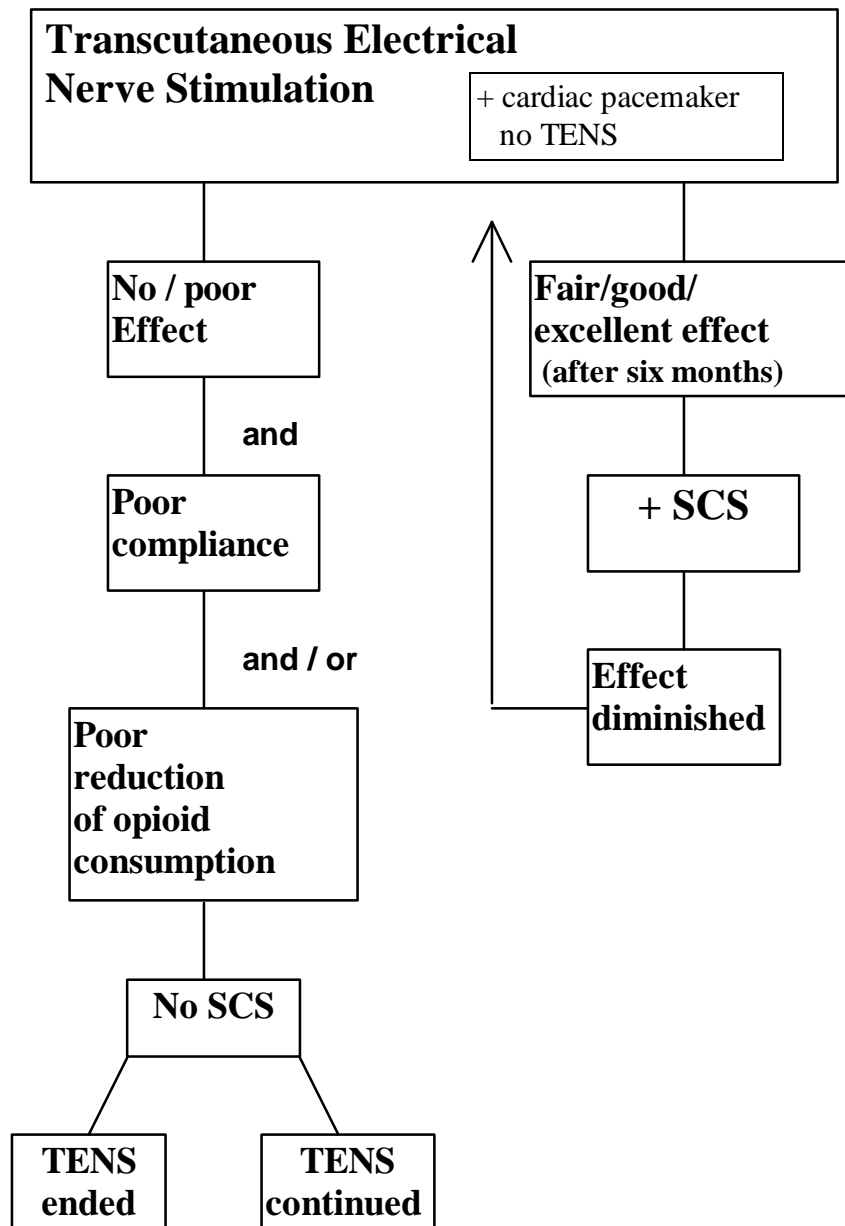
The patient have to make a diary, registrate the number of attacks, the use of TENS and daily opioid consumption. This gives us the opportunity to evaluate their opioid consumption, their compliance and the effect of TENS in the treatment of angina.

### **Follow-up:**

Follow-up is performed after 14 days, 1, 2, 3, 4 and 6 months to ensure good compliance

## **Evaluation:**

After 6 months, evaluation of the opioid consumption, the compliance and the TENS effect on angina is performed.



**Result:**

69 patients have been treated with TENS.

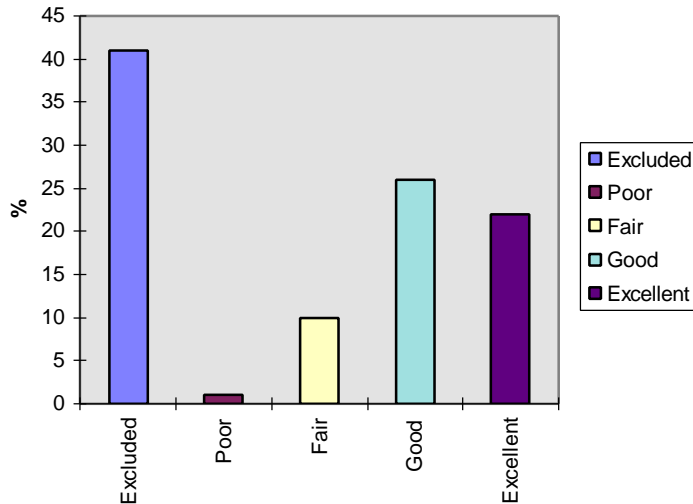
41 of these patients received SCS treatment.

27 patients were excluded due to poor compliance, poor reduction of opioid consumption and poor effect on angina.

1 patient was excluded due to reimbursement problems.

The distribution of the patients concerning the effect of TENS is shown the diagram below.

**Diagram 1**



**Excellent effect:** NYHA I-II, no regular opioid intake, no severe attacks, significantly increased activity in the daily living.

**Good Effect:** NYHA I-II, significantly reduction in opioid intake, reduced number and severity of angina attacks, increased activity in daily living (e.g. garden work, shopping)

**Fair effect:** NYHA II-III, significant reduction of opioid intake, reduced number and severity of anginal attacks, increased activity in daily living (housework, shopping)

**Poor effect:** NYHA II-III some reduction in opioid intake, reduced number and severity (50%) of angina attacks, no increase in activity in the daily living.

**No effect:** The patient has remained in NYHA III-IV, no reduction in opioid intake.

We have tested the correlation between effect of TENS and effect of SCS on angina pectoris. (Spearman rank test,  $P < 0.01$ ) This gives a significant correlation between the patients selected by use of TENS and the patients with effect of SCS ( $p = 0.0012$ ).

### **Conclusion:**

TENS has been used for 6 years at Odense University Hospital and there is a high significant correlation between successrate of the effect on angina with TENS and SCS. A follow up period of minimum six months gives a good opportunity to evaluate the compliance of the patient and ensure reduction or even termination of opioid consumption. We find that TENS is a useful instrument for selecting patients with intractable angina pectoris for SCS treatment.