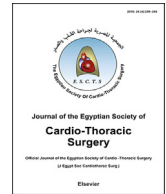


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# Persistent post sternotomy chest pain: Does sternal wire removal have a role?



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## ABSTRACT

**Background:** Persistent post sternotomy pain is a disabling phenomenon and its cause is unclear. It may be related to hypersensitivity reaction to wire, scar entrapped neuralgia, sternal irritation, chondritis or protruding wires. We aimed to evaluate the effectiveness of sternal wire removal on poststernotomy pain relief.

**Methods:** It is a retrospective study conducted on 48 patients who underwent removal of sternal wires due to persistent post sternotomy anterior chest pain. All wires were removed after exclusion of myocardial ischemia, sternal instability and wound infection. Patients were followed up after 3 months and were divided into 3 groups according to pain response: complete improvement, partial improvement and no improvement.

**Results:** The mean age of patients involved in the study was  $39.77 \pm 9.44$ . 66.7% of patients were males. 72.9 %underwent valve surgery. Time lag between primary operation and removal of wires was  $23.65 \pm 9.26$  months. No patients had history of allergy. Regarding response to treatment, patients were asked 3 months after operation about pain relief: 64.6% of patients showed complete improvement, 22.9% had improvement with minimal symptoms, 12.5% showed no improvement thus there was significant improvement in 87.5% of cases.

**Conclusions:** Removal of sternal wires is safe, simple and effective procedure that should be offered to patients with persistent post sternotomy chest pain after exclusion of myocardial ischemia, wound infection and sternal instability.

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## 1. Introduction

Chronic post sternotomy pain syndrome is well recognized phenomenon that was first described by Weber and colleagues after coronary artery bypass graft surgery (CABG) [1].

Generally, it affects about 11–56% of patients post cardiac surgery [2]. After exclusion of myocardial ischemia, wound infection and sternal instability, the cause of persistent pain is unclear and may be related to hypersensitivity reaction to wire, scar entrapped neuralgia, sternal irritation, chondritis or protruding wires [3–5].

Up till now there is no specific protocol for management of such cases and treatment modalities are mainly directed towards the use of different types of analgesic drugs [6].

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Our study aimed to evaluate the role and effectiveness of sternal wire extraction on the outcome of persistent anterior chest pain after median sternotomy.

## 2. Patients and methods

This study was retrospective study including 48 patients who underwent sternal wire extraction in Tanta university hospital and private hospital, Tanta, Egypt during the period from January 2013 till June 2016 due to persistent anterior chest pain after median sternotomy. Persistent pain was defined as unexplained pain lasting for more than 2 months after the primary operation [7].

We excluded patients who experienced chest pain due to myocardial ischemia, sternal instability or mediastinitis. Medical records of all patients involved in the study were revised including age, sex, body mass index, medical history of diabetes mellitus (DM), chronic obstructive pulmonary disease (COPD) and hypertension, history of allergy, type of primary operation, and period from primary operation till removal of wire. Before operation, all patients were subjected to chest X-ray (posteroanterior and lateral views) and CT chest to confirm sternal union and number and shape of stainless steel wire needed to be extracted. Informed consent was taken from all patients involved in the study.

Surgery was done under general anesthesia and fluoroscopic guidance, previous operation scar was excised and all wires were extracted whether protruding or not, any infected area was debrided and wound was closed in layers without drainage. All patients were discharged first postoperative day and were interviewed 3 months after surgery about the fate of chest wall pain. Patients were divided into groups according to response to surgery.

- 1 Group 1: Complete relief of pain
- 2 Group 2: Improvement with minimal symptoms
- 3 Group 3: no improvement

### 2.1. Statistical analysis

Statistical analysis was performed using Statistical Package for Social Science (SPSS version 16). Data were expressed in terms of percentages and frequencies for categorical variables and mean  $\pm$  standard deviation ( $\pm$ Std) for continuous variables. Chi-square ( $\chi^2$ ) test was performed for comparing categorical data. Continuous variable were compared by using student's unpaired t test. P values of  $<0.05$  were considered statistically significant.

## 3. Results

This study was a retrospective study conducted on 48 patients who underwent removal of all sternal wires due to persistent anterior chest pain after sternotomy.

The mean age of patients involved in the study was  $39.77 \pm 9.44$ . Thirty-two (66.7%) patients were males. Thirty-five patients (72.9%) underwent valve surgery, the remainder had CABG surgery and 2 patients had thymectomy. Protruding wires were found in 22.9% of patients. Time lag between primary operation and removal of wires was  $23.65 \pm 9.26$  months. No patients had history of allergy. All patients' characters were shown in [Table 1](#).

Regarding response to treatment, patients were asked 3 months after operation about pain relief: 64.6% of patients showed complete improvement, 22.9% had improvement with minimal symptoms, 12.5% showed no improvement and no patients had worsening of symptoms after the operation. By summation of patients with complete and partial improvement, we found that there was significant improvement in 87.5% of cases as shown in [Fig. 1](#).

So of the 48 patients involved in the study, 6 patients showed no improvement. By comparing the different variables between patients with improvement and those with no improvement, we did not find statistical significant difference between both as shown in [Table 2](#). Accordingly, nothing of these variables was found to be a significant predictor of patients' improvement after removal of wires.

## 4. Discussion

Chronic pain after sternotomy has special dilemma. According to the International Association for the Study of Pain (IASP), chronic pain is a pain without definite cause that continues after the normal healing period of a tissue for more than three months [8]. The cause of such pain is multifactorial and may include: scar of the wound, intercostal nerve injury, rib or sternal fractures, sternal infection and stainless steel wire sutures [9]. Moreover, the intensity of pain is difficult to be determined in accurate manner as it is a subjective symptom that differ from one patient to another. After exclusion of definite causes of post cardiac surgery pain like sternal non-union, mediastinitis and myocardial ischemia, physician attention should be paid towards other less defined causes.

The role of stainless steel wire in the etiology of chest pain after sternotomy have been discussed before in literature; however, there is shortage in series that addressed the role of wire extraction on relief of persistent post sternotomy pain. Hypersensitivity reactions to various compositions of wire like manganese, nickel and other component were documented in some reports and confirmed by patch test to detect hypersensitivity reaction [10–12].

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