Endoscopic transthoracic sympathectomy (ETS)

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Findings by SBU Alert

Endoscopic transthoracic sympathectomy (ETS) is used on a limited scale as a complement to traditional treatment methods for severe coronary heart disease. In patients where traditional methods do not help, or where the risk of, eg, coronary artery surgery is perceived to be excessive, ETS may be considered. However, experience with the procedure is limited, and only a few open studies on ETS have been conducted.

The findings by SBU Alert show that poor* evidence is available about ETS as regards side effects, risks, and short-term effects. There is no* scientific evidence demonstrating the long-term results of the method or its cost effectiveness in relation to other methods.

If the results from pilot studies are confirmed by current randomised studies, the method may prove to be a valuable alternative for patients in whom problems persist after traditional therapies have been unsuccessful. Until further notice, the method should be used only in a controlled way within the framework of scientific studies. An assessment should be carried out addressing treatment benefits in relation to the risks for side effects, direct healthcare costs, and socioeconomic effects.

*This assessment by SBU Alert uses a 4-point scale to grade the quality and evidence of the scientific documentation. The grades indicate: (1) good, (2) moderate, (3) poor, or (4) no scientific evidence on the subject. For further information please see “Grading of evidence”.

Technology

Open surgical sympathectomy was used to treat angina pectoris as early as the 1950s and 1960s [2,3]. Interest in the method, however, declined when the heart–lung machine enabled surgeons to perform coronary artery surgery on a large scale. The development of endoscopic surgical techniques has resulted in a renewed interest for sympathectomy in coronary heart disease.

ETS involves cutting the sympathetic nerve at a level corresponding to the first to fourth (fifth) thoracic segment. The surgical technique was originally developed for treating patients with severe hand perspiration (palmar hyperhidrosis) [4]. In patients presenting with both hand perspiration and angina, their angina was found to improve following surgery for hand perspiration. This information was combined with previously reported results on sympathectomy from the 1940s.

The first case of endoscopic surgery for angina was done in Sweden in 1992. The procedure is performed under general anesthesia and requires a surgeon with extensive experience. Compared to similar interventions in patients with hand perspiration, surgery for angina is technically more complicated since the patients on average are older and may have adhesions from previous coronary artery surgery. Furthermore, the greater volume of fat surrounding the nerve and more rigid lungs in patients with angina create greater surgical problems from a technical standpoint. Furthermore, the method requires very good collaboration between the surgeon and anesthesiologist to reduce anesthetic risks, eg, due to increased sensitivity for fluctuations in the blood pressure level.

The operation is conducted as an inpatient procedure in Sweden, with an average operating time less than one hour and an average length of stay of two days.

Target group

The number of patients investigated and treated surgically for coronary heart disease has increased substantially during the 1980s and 1990s. In 1996, over 18 000 angiographies were performed, approximately 7 000 coronary artery operations, and approximately 6 000 balloon dilations [1]. Despite the optimum utilization of coronary artery procedures and medical treatment, a group of patients remains in whom angina continues to be severe symptom. There are no exact figures on how many patients annually are affected by angina that does not respond well to treatment. According to one SBU report [1] this patient group comprises approximately 7 per cent of all patients who are investigated for stable angina, ie, approximately 700 patients per year. This figure is probably underestimated since patients who are not expected to be treated by traditional methods, eg, patients with complicated diseases, are not referred for angiography. Other groups who would benefit from the method include approximately 1 400 patients who have already undergone coronary artery surgery but have persistent problems, and approximately 300 patients at high risk for coronary artery surgery, ie, upward toward 2 000 patients.

Relation to other technology

Despite the expansion of diagnostics and surgical capacity and the introduction of new treatment methods in the field of coronary artery disorder, there is a group of patients who are not sufficiently helped by the usual procedures. Several nonpharmacological alternatives have been tested, eg, TNS (transcutaneus nerve stimulation), spinal cord stimulation (ESES), and transmyocardial laser (a method of creating channels in the heart muscle with lasers). Of these methods, TNS and ESES have shown good outcomes on pain and also myocardial ischemia, but have not been assessed in any large prognostic studies. Transmyocardial laser therapy has not been subjected to thorough assessment. All of these methods need to be further assessed as regards their effect on symptoms which influence morbidity and mortality. The results of ongoing assessments of the various methods are expected within a few years. Then, the associations between the various methods can be better assessed.

Patient benefits

ETS has been studied in only a few non-controlled studies. Early results of open surgical treatment involving sympathectomy for angina are found in a Swedish study from the 1940s and an English series from the 1960s [2,3]. The primary medical variables in assessing ETS are attack frequency, severity of

angina, and working capacity. Here, ETS has clearly shown positive effects, and the rate of side effects has been low [4,7]. Furthermore, the effects on heart rate variability have been shown, which can offer indirect information on potential risks for severe arrhythmia [8]. Short-term results show that sympathetic activity decreases at the same time as parasympathetic activity increases [9]. In another unpublished long-term followup of 82 patients after one to two years, the positive effects on work capacity remain, and there are signs of reduced oxygen deficiency in the heart muscle during stress at the same time as symptoms continue to be milder compared to before the operation [10,11]. Mortality in this patient series is approximately 4 per cent per year, which is about the same as in unselected groups of patients who have undergone coronary artery surgery.

Complications and side effects

In isolated cases, patients have required evacuation of air from the pulmonary sack as long as 24 hours after surgery. Also, a few cases of incomplete Horner's syndrome, which involves droopy eyelids and a small pupil on the side affected, have been reported [7]. Slightly over 50 per cent of the patients experienced increased perspiration in the lower half of the body after surgery. Approximately 2 per cent have substantial problems involving increased perspiration. The risk for this side effect increases with major interventions (more than four operated segments per side). Furthermore, muscle fatigue has been reported in isolated cases.

In the substantially more common procedure, transthoracic sympathectomy for hand perspiration, isolated reports show a higher percentage of patients with substantial problems such as compensatory perspiration following surgery. Deaths have also been reported [5,6].

Costs and cost-effectiveness

An ETS operation including two inpatient days costs approximately 30 000 SEK in 1998 (based on DRG reimbursement). Followup visits beyond those for the patient's primary disease are not required. A followup study [10,11] shows that during the first year following surgery, the number of acute admissions declined from 3 prior to surgery to 1.4, and the stay in hospital declined from 18.5 to 10.2 inpatient days. The reduction corresponds to a reduced healthcare cost of approximately 20 000 SEK per patient during the first year after surgery. In patients who were gainfully employed, absenteeism also declined.

A general comparison with established interventions for coronary artery disease shows that the costs for ETS are competitive. The direct costs for the procedure are relatively low and repeat procedures are rare (1 in 82 patients were operated twice) [11]. The short postoperative length of stay and limited convalescence period is valuable, particularly for patients with short remaining life expectancy. The exact magnitude of costs and patient benefits for ETS in relation to other methods remains to be studied in controlled trials.

Structure and organization of health services

A potential future use of ETS as routine practice would presumably influence the healthcare organization to only a minor extent. The method should be used only in a few centers having access to experienced endoscopic surgeons (eg, surgeons with broad experience in similar procedures involving hand perspiration patients). Furthermore, anesthesiologists and cardiologists having adequate skills and experience in the method are required. Surgical therapy for perspiration is performed at approximately 30 hospitals in Sweden. Several of these hospitals could be developed into ETS centers for treating angina.

Ethical aspects

A large group of patients with difficult-to-treat coronary artery disease are currently referred to inadequate ongoing treatment since, for various reasons, they cannot be fully revascularized. Present experience suggests that ETS is a possible treatment alternative for these patients. Early results suggest that the risks and side effects are reasonable in relation to the expected patient benefit from surgery. Until a thorough scientific assessment has been conducted, the method should be used only under controlled

application and within the framework of scientific studies-the purpose being to expand scientific knowledge about the procedure as rapidly as possible.

Diffusion in Sweden

ETS was first tested in Sweden at Borås Hospital, which is also the hospital in Sweden having the greatest experience with the procedure. Some experience with the method is also found at Sahlgrenska Hospital. Isolated patients have been operated at other Swedish hospitals. In total, approximately 130 patients have been treated in Sweden. Internationally, the method is used sparingly.

Current evaluation research

A randomized study comparing ETS and medical treatment, covering 60 to 80 patients, is expected to be concluded during year 2000. The study was conducted in Borås and Göteborg. Also under way is another randomized comparison between ETS and coronary artery surgery on patients with high operative risk or need for reoperation. Other research into and development of ETS is under way internationally, and a third international congress on the topic was held in May 1999 in Japan. A problem which can soon be resolved concerns the risk of increased perspiration following surgery. By using clips instead of cutting the nerve, the nerve function can be reinstated if the side effects become severe. This method needs to be thoroughly assessed.

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