Organising a Nurse-driven PAD Rehabilitation Clinic Within the Vascular Surgical Department: What is Required and are Treatment Goals Reached — A Prospective Study?

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Objectives. Patients with PAD may have severe symptoms from their lower extremities as well as a 3-4 fold increased risk of death due to systemic atherosclerosis. The purpose of this study was to identify whether treatment goals of a nurse led rehabilitation clinic were achieved.

Design. Prospective cohort study over 4 year period to May 2004.

Methods. All patients with symptomatic PAD were offered enrolment in a nurse-led rehabilitation clinic and given advice on diet and exercise. All smokers were offered smoking cessation advice and treatment. Anti-platelet therapy was prescribed to all patients and statin therapy was prescribed to those with dyslipidemia.

Results. 693 patients with symptomatic PAD were prospectively entered into the clinic (total 2563 clinic visits). Average age was 67 years and 53% were males. Some (167, 24%) were included for non-surgical treatment and most (526, 76%) were included as part of their postoperative follow-up. After 6 months, the proportion of patients taking platelet inhibitors and statins had increased from 63% and 27% to 87% and 84% respectively. Mean total cholesterol was reduced from 6.2 mmol/l to 4.9 mmol/l and mean LDL cholesterol from 3.9 mmol/l to 2.6 mmol/l. After 1 year the proportion of smokers was reduced from 59% to 51.5% (12.5% relative reduction).

Conclusion. This nurse-driven rehabilitation clinic has proven effective in reaching medication targets for secondary prevention. Smoking cessation was less successful.

Keywords: PAD; Prevention; Life style; Cholesterol; Statins; Platelet inhibitors.

Introduction

Peripheral arterial disease (PAD) is associated with a significantly increased morbidity and mortality due to the generalised nature of atherosclerosis. The risk of dying from coronary artery disease (CAD) is increased by a factor 2–4 depending on the severity of the lower limb disease.1–4 Thus, it is recommended, that patients with PAD should receive advice on life style changes and prophylactic medical therapy for secondary prevention to reduce the risk of atherosclerotic complications.5–9

Traditionally, vascular surgeons (and interventional radiologists) have focused on measures related to improving symptoms from the lower limb(s) and, either not paid attention to the generalised risk of PAD patients, or referred patients to other physicians for treatment of the underlying atherosclerotic disease. However, recent data have shown that the former situation appears to be more common than the latter, with data from primary care being disappointing. The number of patients receiving proper counseling and medical therapy has been disappointing low.3,10–13

In our own department, we surveyed patients operated mainly for critical limb ischemia during 1998 and found the level of medical treatment to be poor: only 39% of patients were on aspirin and 5% were receiving lipid lowering drugs (statins), even though almost 40% had established coronary artery disease, CAD.3 Since no other medical specialty had shown interest in undertaking the preventive task in these patients, the perception of PAD as a CAD equivalent among primary care physicians (PCP) has not been established. Because all patients treated in our unit...
already came for a minimum of 2 postoperative follow-ups (1 month and 1 year after treatment), we decided to organise our own PAD rehabilitation clinic.

This paper describes the organisation of the clinic, Gang-I-Gen (GIG) at Gentofte University Hospital and the results obtained since the start in year 2000 until May 2004.

Patients and Methods

Development of the concept: From the beginning, it was realised, that the time needed to offer proper counselling, especially with relation to changes in life style, was much more than the surgical staff could provide in a meaningful manner. Thus, it was decided that nurses, following written guidelines (available as Web Supplement), should be the main driving force in the rehabilitation clinic, under supervision and responsibility of the vascular surgeons. The premise was for a nurse to offer all simple preventive measures needed by patients with atherosclerotic manifestations: informing the patient in such a manner that they individually would be able to make decisions on life-style changes with respect to smoking cessation, regular physical exercise and eating habits. The information given had in each case to be adjusted to the patients existing knowledge, need and motivation for changes in life-style. Also, the clinic should focus on appropriate medication for secondary prevention, including anti-platelet and lipid-lowering drugs. Treatment of other risk factors, e.g. hypertension or diabetes was attempted. However, when hypertension and diabetes was diagnosed patients were referred for treatment.

In order to monitor the activity and evaluate whether treatment goals were reached, a database was developed (Gig software). The records included data on other atherosclerotic manifestations, risk factors, previous interventions, details of lower limb symptoms and objective findings, laboratory values, advice and medications (see description below). At every visit to the clinic, new data would be entered.

All information was kept electronically, however, the date of the visit was stamped in the chart to indicate that a visit to the clinic had taken place. Also, a specific printout from the database was put into the chart with a short summary of findings i.e. vital signs, lab values and a short description of specific problems or arrangements. Additionally, a 2-page printout was generated for the patient with 6 graphs showing the historic development of their blood pressure, ankle-brachial index (ABI), lipid values, weight, smoking status and self reported walking distance (Fig. 1). Results of clinic blood tests were available within 1 hour, so that results could be immediately discussed with the patient.

In September 2002, all nurses in the outpatient clinic (6 nurses) were trained to offer the counselling/treatment. This included training as “smoking cessation instructor”, increased level of knowledge with regard to nutrition for patients with atherosclerosis and knowledge about theories behind changes of habits/life-style according to Prochaska and DiClementes. Thus, the vascular nurses, who already were capable of measuring ankle pressures, wound treatment and duplex scanning, were also able to give counselling and oversee the preventive treatments.

Organisation of the clinic. The attending vascular surgical consultant saw all new referrals. If interventional treatment was considered immediately, advice on life-style changes were given briefly by the consultant, but the GIG consultation was postponed until after the final treatment plan was made or executed. It was felt to be very important, that the consultant doing the initial evaluation of the patient, would explain the importance of the life style changes and medical therapy.

The time needed for a nurse to do a consultation varied depending on whether it was the first GIG visit for the patient and on which life style interventions were needed. Additional time could be needed for wound care, postoperative follow-up and/or an ultrasound examination and data entry. The average nurse consultation lasted 45–60 minutes.

GIG counselling was offered to all patients referred to the department of vascular surgery not already enrolled into health prevention programmes, such as those for patients with diabetes. Patients were offered 5 visits over one year, or 5 visits within the year after surgery. Intervals were 6 weeks between visit 1,2 and 3, 3 months between 3 and 4 and 6 months before the last visit.

Description of the GIG software. The Danish Data Regulatory Authority gave permission to keep the electronic patient data for this study. The database holds up to 100 variables covering medical history, risk factors, present symptoms and measurements with focus on the lower extremities, and data on counselling and laboratory values. Most fields are coded with either yes/no or a one-digit code for different conditions. Many of the codes entered will be carried forward to the next visit and only require attention if the patients condition has changed. A section on medication allows for entering prescriptions. A section for comments allows for entering free text when necessary. The last section is the printout/analysis module. Patient print-outs are educational (for the patient to become more responsible for his/her targets), can be shown
to family members or the patient’s family practitioner (Fig. 1). Finally, it also shows a list of prescribed medications, the date of the next visit in addition to simple advice on healthy behaviour. The printout for the patient chart includes basic variables like ABI, lab tests and the written text if any. Standard letters for patients family practitioner can be generated when patients enter the GiG rehabilitation clinic and when they finish, including laboratory results, medications etc.

Data analysis. Data were analysed using SPSS version 12.00.2. Continuous data were compared with paired t-test and categorical data with $\chi^2$-test. Change in walking distance was compared with Wilcoxon signed rank test. A two-sided $p$ value $\leq 0.05$ was considered statistical significant.

**Results**

The first patient entered the GiG clinic in April 2000 and by May 1st 2004 693 patients had been enrolled. By September 2004, all patients had a minimum of one follow-up visit and the total number of GiG clinic visits

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Fig. 1. Page 1 of the patient report (fictive patient, original text in Danish), showing development in cholesterol values (top left), blood pressure (top right), ankle-brachial index (bottom left) and self reported walking distance (bottom right). Page 2 (not shown) illustrates tobacco use and weight changes over time, lists medications and gives the date and time for next visit.
was 2563. The demographic details of the 693 patients are shown in Table 1: the mean age was 67 years and 53% were male. One hundred and sixty seven (24%) patients without open surgical or endovascular intervention (patients with intermittent claudication) and 526 (76%) patients were included as part of their post-operative follow-up (for peripheral balloon angioplasty, peripheral thrombo-endarterectomy or bypass).

The medications of the patients are shown in Fig. 2. At entry, 63% of patients were taking aspirin and 27% statins. After 6 months these numbers had increased to 87% and 84% respectively. At 12 months the numbers were approximately the same: 88% and 92% respectively. The use of antihypertensive drugs, beta-blockers and ACE-inhibitors remained at a low level throughout the 12-month period.

At entry, mean total cholesterol value was 6.2 mmol/L (Standard error (SE) 0.05 mmol/L) and mean LDL was 3.9 mmol/L (SE 0.05 mmol/L) (Fig. 3). After 6 months there was a mean reduction of 23% ($p < 0.0001$) in total cholesterol to 4.9 mmol/L (SE 0.05 mmol/L) and 34% ($p < 0.0001$) in LDL cholesterol to 2.6 mmol/L (SE 0.04 mmol/L). At 12 months the cholesterol reduction was slightly greater: 24% ($p < 0.0001$) and 35% ($p < 0.0001$) for total and LDL cholesterol respectively. Most patients (78%) met the Danish recommendations for patients with atherosclerotic disease, which, until September 2003, was total cholesterol < 5 mmol/l and LDL < 3 mmol/l, by 12 months.

At clinic entry 59% patients were smokers and 5% patients claimed that they had never smoked (Fig. 4). By 6 months the proportion had decreased to 54.8% and at 1 year to 51.5% (12.5% of smokers stopped smoking during their participation in the GiG rehabilitation programme). The mean blood pressure on entry was 153/79 mmHg. By 6 months this had fallen to 148/77 mmHg and remained at this level at 12 months (148/76 mmHg) ($p < 0.0001$).

Self reported walking distance increased in the group treated without surgical or endovascular intervention: median walking distance of 200 m (range 0–3000 m) at entry increased to 800 m (range 0–10,000 meter) after 6 months, $p < 0.001$.

Mean weight at entry was 75 kg (range 37–127 kg) and after 12 months mean weight 74 kg (range 39–122 kg).

**Discussion**

The targets for secondary prevention medication were achieved in this nurse-led clinic. Most patients (88%) were prescribed platelet inhibitors. Since some patients may have contraindications or otherwise not tolerate aspirin or clopidogrel, better targets are probably unrealistic. On entry to the clinic only 27% patients had been prescribed cholesterol lowering drugs (statins), but by 1 year nearly all patients (92%) had been prescribed a statin. This result clearly reflects the seriousness with which dyslipidemia is regarded within our institution. Both these results show a major improvement compared to our data from 1998. These good results we present may relate to the fact that patients had to actively accept participation to join the rehabilitation clinic. Thus, less motivated patients might not have accepted the offer, thereby making the results seem better. On the other hand, patients who were already well treated or who were attending another rehabilitation programme were not included. Also, our very high rate of prescription of antiplatelet drugs and statins does not necessarily imply that patients are taking these drugs (compliance), however, the average level of cholesterol achieved and the high percentage reaching treatment goals indicates that many of our patients were changing behaviour and taking the prescribed medicine.

There is accumulating evidence that patients with PAD are not offered secondary prevention as often as patients with CAD. In a survey among Danish General Practitioners only 27% of patients with diagnosed PAD were prescribed statins compared to 75% in patients with coronary heart disease. In a British study of patients referred for vascular surgical evaluation due to PAD, 78% were found to be prescribed aspirin and 38% a statin. In two recent North American studies, also of PAD patients who had undergone revascularization, 72% were found to be prescribed anti-platelet agents and only 31% and 50% were prescribed statins. In the recent REACH registry 81%...
of PAD patients were found to on antiplatelet medication and 64% on a statin.\textsuperscript{16} PAD patients have a lower chance of being prescribed preventive medications by family practitioners as compared to patients suffering CAD.\textsuperscript{12,15,17} In this latter study, McDermott et al.\textsuperscript{17} found that vascular surgeons had highest threshold for initiation of statin therapy as compared to cardiologists, general internists and family practitioners. This leaves a serious educational challenge for vascular surgeons.

The success of the rehabilitation clinic in prescribing medical therapy was not matched by success in smoking cessation, only 12.5% of smokers actually stopped smoking during the reported year of attendance at the clinic: much less than some reported studies. In the retrospective study of Youssef \textit{et al.},\textsuperscript{21} half of the attending PAD patients, who were active smokers, stopped smoking. Similar results were found by The Vestfold Heartcare Study Group\textsuperscript{22} investigating patients with CAD. Also Froelicher \textit{et al.}\textsuperscript{23} found that approximately 50% of patients with cardiovascular disease would stop smoking, however, being randomised to attend a nurse-managed cognitive behavioural relapse-prevention intervention did not result in a significant higher number who stopped smoking.

Our rehabilitation concept is evolving and treatment of hypertension is now being included when necessary. All pre-operative patients are prescribed

![Graph showing the use of drugs in Patients entering GiG from entry until 12 months control.](image1)

**Fig. 2.** The use of drugs in Patients entering GiG from entry until 12 months control.

![Graph showing the development of cholesterol values over time.](image2)

**Fig. 3.** Development of cholesterol values over time.
a beta-blocker for the perioperative period and untreated patients with mild or moderate hypertension are prescribed ramipril (ACE-inhibitor). A similar clinic has been established at Rigshospitalet, also in Copenhagen, and the vascular nurses in the two hospitals meet regularly to exchange experience and to give input to future modifications of the concept. A future challenge will be to secure the continuing high levels of patient care, after one year of clinic attendance, when they are returned to the care of their family practitioner.

Conclusion: A nurse-led clinic within a vascular surgical setting, working to strict guidelines, is effective in establishing medical therapy for secondary prevention for PAD patients. Further developments to improve smoking cessation will be required.

Appendix. Supplementary data

Supplementary data associated with this article can be found, in the online version, at 10.1016/j.ejvs.2006.07.022

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