

ASSESSMENT OF PATIENT WAITING TIMES FOR VASCULAR SURGERY

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OBJECTIVES: To assess patient waiting times for vascular surgery and to determine if complications of the disease develop while the patients are awaiting surgery.

DESIGN: Prospective cohort study.

SETTING: A university-affiliated tertiary care institution.

PATIENTS: All 554 patients who underwent scheduled vascular surgical procedures between April 1995 and October 1996.

OUTCOME MEASURES: A literature review carried out to develop guidelines for acceptable waiting times for surgery associated with various vascular disorders based on their natural history (benchmark target); actual waiting times, defined as the interval from the date each patient was booked for surgery to the date of admission to hospital for the procedure; the proportion of patients admitted within the benchmark targets; and whether prolonged waiting time placed patients at risk for complications of their disease.

RESULTS: Of the 554 patients, 382 (69%) were admitted within the benchmark waiting times. Of 84 patients having an abdominal aortic aneurysm, the aneurysm ruptured during the waiting period in 6, and 4 of them died, for a complication rate of 7% and a death rate of 5%. Two of the 6 aneurysms ruptured after the patient had waited longer than the target time. Three of 100 patients with symptomatic carotid artery stenosis awaiting admission for carotid endarterectomy suffered ischemic stroke, for a 3% complication rate; all had waited longer than the target period. One patient suffered occlusion of a femoropopliteal bypass graft while awaiting revision of a stenosed bypass graft.

CONCLUSIONS: This study suggests that although most patients are admitted for operation within the benchmark time, one-third are admitted late and may suffer serious complications of their disease while awaiting admission for the procedure.

OBJECTIFS : Évaluer le temps d'attente des patients pour une chirurgie vasculaire et déterminer si la maladie s'aggrave pendant cette période.

CONCEPTION : Étude prospective par cohorte.

CONTEXTE : Établissement de soins tertiaires affilié à une université.

PATIENTS : Les 554 patients qui ont subi une chirurgie vasculaire prévue entre avril 1995 et octobre 1996.

MESURES DE RÉSULTATS : Une recension des écrits pour élaborer des lignes directrices sur le temps d'attente acceptable pour une chirurgie de traitement de divers troubles vasculaires selon leur évolution naturelle (temps d'attente visé); temps d'attente réels, définis comme étant l'intervalle entre la date d'inscription de la chirurgie de chaque patient et la date d'admission à l'hôpital pour subir l'intervention; pourcentage des patients admis à l'intérieur des temps d'attente visés; et si la prolongation du temps d'attente a exposé les patients à d'autres complications de leur maladie.

RÉSULTATS : Des 554 patients, 382 (69 %) ont été admis à l'intérieur des temps d'attente visés. Parmi les 84 patients souffrant d'un anévrisme aortique abdominal, l'anévrisme s'est rupturé pendant la période

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Presented at the 19th annual meeting of the Canadian Society for Vascular Surgery, Vancouver, BC, Sept. 27, 1997.

Funded by the Patricia F. & Robert C. Rodgers Fellowship for Vascular Surgery Endowment Foundation.

Accepted for publication June 24, 1999.

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d'attente chez six d'entre eux, dont quatre sont décédés, pour un taux de complication de 7 % et un taux de décès de 5 %. Deux des six anévrismes se sont rompus après que l'attente se soit prolongée au-delà du temps d'attente visé. Trois des cinq patients ayant une sténose symptomatique de l'artère carotide ont eu un accident ischémique cérébral pendant qu'ils attendaient une endartériectomie de la carotide, pour un taux de complication de 3 %; pour tous ces patients, l'attente avait dépassé le temps d'attente visé. Un patient a souffert d'une occlusion de son greffon de dérivation fémoropoplité pendant qu'il attendait la correction d'une sténose du greffon.

CONCLUSIONS : L'étude laisse entendre que même si la plupart des patients sont admis à l'intérieur des temps d'attente visés, le tiers est admis plus tard, et des complications de la maladie peuvent survenir pendant qu'ils attendent l'intervention.

As a result of the financial cutbacks and increased demand on the health care system, there are now waiting lists for most surgical procedures. Ideally, patients should be admitted to hospital and treated as soon as a decision has been made by the patient and the physician to proceed with surgical treatment. However, this is often not the case — many patients wait weeks or even months for scheduled operative procedures. During this time, patients must endure any discomfort and risk associated with their disease and the anxiety caused by a delay in treatment. The risks associated with waiting for definitive surgery for various conditions have not been well defined and are a critical issue in determining the quality of health care delivery. These risks depend on the natural history of the disease in question, which is known or can be estimated for many life-threatening and disabling conditions. The purpose of this study was to define a maximum acceptable waiting time for various common vascular surgical conditions, making use of our knowledge of the natural history of the diseases. This measure was then applied to the patient population at our institution to determine if such patients are being treated within acceptable waiting times and whether adverse outcomes occurred while the patients were waiting for operation.

METHODS

Acceptable waiting times were determined for each of the following

conditions: carotid artery stenosis (both symptomatic and asymptomatic), abdominal aortic aneurysm, critical limb ischemia, vascular access for hemodialysis, impending bypass graft occlusion and lifestyle or work-disabling disorders (vascular claudication, venous disease, thoracic outlet syndrome). For each of these diseases, a review of the literature with reference to the natural history of the disease was carried out. In general, the maximum acceptable waiting time for surgery was defined as the period beyond which the risk of waiting exceeded the risk of the surgery itself. When the risk of the disease was not high but patients were disabled by their condition, a maximum acceptable waiting time was arbitrarily defined.

Symptomatic carotid artery stenosis

The North American Symptomatic Carotid Endarterectomy Trial (NASCET) showed that carotid endarterectomy (CEA) was significantly better than medical therapy for preventing stroke in patients with greater than 70% stenosis of the carotid artery if the stenosis was associated with symptoms of transient ischemic attacks (TIAs) or minor stroke.^{1,2} In medically treated patients, the risk of recurrent stroke was highest in the first month after the initial TIA or stroke (4% in the first month or 1% per week).³ The NASCET reported a risk of major perioperative stroke or death in approximately 2% of patients who underwent CEA, a rate that is gener-

ally expected for this procedure. These data were confirmed by the European Carotid Surgery Trial.⁴ The risk of stroke from untreated symptomatic carotid artery stenosis is highest for those with more severe stenosis. Therefore, a patient with symptomatic carotid stenosis who waits for surgery for more than 2 weeks after a TIA or minor stroke faces a higher risk of stroke waiting for surgery than from the surgical procedure itself (1% per week risk of stroke multiplied by 2 weeks = 2% risk while waiting for procedure versus a 2% risk of stroke or death from procedure). The maximum acceptable waiting time for patients with symptomatic carotid stenosis was therefore set at 2 weeks.

Asymptomatic carotid artery stenosis

The Asymptomatic Carotid Atherosclerosis Study (ACAS)⁵ showed that patients with high-grade asymptomatic carotid stenosis were at increased risk of stroke and that this risk could be reduced by CEA if the procedure could be performed with minimal morbidity. Although not shown in the ACAS, other studies have found that in asymptomatic patients, the risk of stroke is highest in those with the most severe degree of stenosis.⁶⁻⁹ Overall, the risk of stroke associated with severe asymptomatic carotid artery stenosis is about half or less than that of symptomatic stenosis.⁶⁻⁹ We therefore defined the maximum acceptable waiting time for patients with this condition as 4 weeks (twice that

of symptomatic disease).

Abdominal aortic aneurysm

The major risk of aortic aneurysm is rupture, which is associated with an absolute death rate of approximately 90%. Of those patients who survive to reach hospital, the death rate is still about 50%.¹⁰ The risk of rupture increases with increasing size of the aneurysm. Aneurysms having a diameter greater than 5 cm have a risk of rupture of 5% to 20% per year depending on their size (0.5% to 2% per month). The death rate associated with elective repair of an aortic aneurysm in a recent large clinical series at our institution is 1% to 2%.¹¹ Therefore, in patients who wait longer than 4 weeks for surgery, the risk of rupture and death begins to exceed the risk of death from surgery (0.5% to 2%/month risk of rupture while waiting versus 1% to 2% death rate associated with the procedure). We therefore defined, the maximum acceptable waiting time for aneurysm repair as 4 weeks.

Critical limb ischemia

Patients having severe ischemic rest pain or gangrene from arterial occlusive disease are at high risk of progressive tissue necrosis and infection resulting in major amputation. They also have severe pain, preventing normal activity and sleep. In patients presenting with severe ischemic rest pain or gangrene, the risk of major limb loss is very high without successful revascularization.¹² The expected risk of limb loss in these circumstances is effectively 100% at 6 months. The death rate associated with revascularization is about 5%. Therefore the risk of limb loss associated with a waiting period of more than 2 weeks exceeds the operative mortality. Because of this high risk of limb loss without revascularization surgery and associated severe symptoms we defined

the maximum acceptable waiting time for surgery as 2 weeks.

Failed vascular bypass

With careful follow-up by ultrasonography, limb bypasses that are at risk of failure can be identified before complete thrombosis occurs.^{13,14} Early intervention to prevent graft failure leads to improved patency of the graft with minimal morbidity and decreased limb loss.^{15,16} Graft thrombosis on the other hand may not be reversible and may lead to limb loss. In the face of a known correctable defect in a bypass graft, we believe the surgeon must attempt to repair the lesion within 4 weeks in order to minimize the risk of thrombosis and possibly loss of the bypass. Data to support this time to intervention, however, are not as strong as for other conditions.

Vascular access for hemodialysis

Patients with chronic renal failure require either long-term dialysis or renal transplantation to survive. With limited availability of renal allografts, almost all patients require some period of dialysis. Chronic renal failure progresses at different rates, but in general, once renal failure becomes symptomatic, dialysis is required within 1 to 2 months or severe metabolic and fluid disturbance leading to death will occur. Once vascular access is established, a waiting period of 1 to 2 months may be required before it can be used for hemodialysis. With these 2 time restraints establishing the urgency of vascular access surgery for hemodialysis, we believe that a maximum waiting time for these procedures is 4 weeks.

Lifestyle- and work-limiting disability

Patients who have claudication or exercise-induced pain from arterial

occlusion can be prevented from performing their normal daily activities and from productive work. However, these patients are not at significant risk for limb loss.¹⁷ Patients with other disabling conditions such as symptomatic thoracic outlet syndrome or symptomatic venous disease may suffer to the extent that they are unable to work or perform normal daily activities.¹⁸ When effective surgical therapy exists and is indicated, how long should such disability be allowed to continue before the waiting period is considered unreasonable? We have arbitrarily defined 12 weeks (3 months) as the maximum acceptable waiting time, recognizing that this decision is subjective. This period is similar to or longer than most patients would accept for conditions of similar disability such as arthritis of the hip.

Waiting times

Using these guidelines (the benchmark waiting time for each condition), hospital admission information was collected on all patients scheduled to undergo elective procedures in the Division of Vascular Surgery at the Vancouver Hospital from April 1995 to October 1996. The waiting time was defined as the interval from the date on which the surgery was booked to the date of the patient's admission to hospital for the operation. The waiting time for admission was the same as the waiting time for surgery, since patients were admitted either on the day of surgery or 1 day before. The date of booking for surgery was the date that all preoperative investigations were completed and both surgeon and patient agreed to proceed with surgery. The wait for vascular consultation or investigation was not recorded. For urgent problems (aortic aneurysm, carotid artery disease) in general, the wait is less than 1 week in our practice. Complications occurring during the waiting period were recorded.

Information was compiled on a personal computer running a Microsoft Excel spreadsheet. Cases were classified under headings of carotid artery stenosis — symptomatic and asymptomatic — abdominal aortic aneurysm, ischemic leg, vascular access, impending graft failure, and lifestyle/work. Within each of these categories, the total number of patients and the number of patients admitted within the benchmark waiting times were recorded. From these values, a proportion of patients meeting the waiting time criteria was calculated.

RESULTS

Over the 19 months of the study, 554 procedures were performed at our institution. Patients were classified into one of the study disease categories. All scheduled procedures performed during the study interval were analysed.

The average wait varied by disease from 2 weeks for impending bypass graft failure to 8.3 weeks for lifestyle-limiting or disabling conditions. The average wait for surgery was 4.2 weeks (Table I) (range from 0 to 29 weeks). The average wait for surgery in the

172 patients who waited longer than the acceptable benchmark time was 6.5 weeks. Table II shows the stratification of patients in each disease group by the number of days that they waited. We did not analyse our patient groups by subcategory (e.g., symptomatic carotid artery stenosis by degree of stenosis or aneurysm by size), because the numbers were too small to provide meaningful results.

Overall, 382 (69.0%) patients were treated within the benchmark waiting times defined and 172 patients (31.0%) waited longer than the maximum acceptable waiting time. The proportion of patients treated within the benchmark time varied by disease (Table III), but the differences were not significant (χ^2 test).

Symptomatic carotid artery stenosis was treated within the benchmark time (2 weeks) in 57% of patients (57 of 100 procedures). Asymptomatic carotid artery stenosis was treated within the benchmark time (4 weeks) in 65% of patients (57 of 88 procedures). The average waiting times for these conditions were 3.0 weeks and 4.3 weeks respectively. Three patients (3%) with symptomatic carotid artery

stenosis suffered a stroke while waiting for CEA. All had waited longer than the acceptable waiting period for this disease (waiting times 4, 6 and 8 weeks). None of these patients died of the stroke. Three other patients had crescendo TIAs while waiting for surgery and required emergency admission, anticoagulation and emergency operation. An additional 5 patients had recurrent symptoms of TIA while waiting for longer than 2 weeks. The total neurologic complication rate in symptomatic patients while waiting for surgery was 11% (11 of 100).

Aortic aneurysms were treated within the benchmark time (4 weeks) in 70% of patients (59 of 84 procedures). The average waiting time was 3.6 weeks. Six patients (7%) had an abdominal aortic aneurysm while waiting for surgical repair. The waiting times for these patients were 14, 21, 24, 25, 90 and 164 days. Of these 6 patients, 4 died (5% death rate), 3 had been waiting less than 1 month and 1 had been on a waiting list for longer than 1 month. The risk of rupture for those waiting less than 4 weeks for aneurysm surgery was 5% (4 of 84) and the death rate was 4% (3 of 84).

Table I

Average Waiting Periods for Patients Scheduled to Undergo Vascular Surgical Procedures

Procedure	Benchmark time, wk	Average time for	
		for all patients, wk	patients not meeting benchmark, wk
Carotid artery stenosis			
Symptomatic	2	3	5.7
Asymptomatic	4	4.3	9.1
Abdominal aortic aneurysm	4	3.6	8.0
Ischemic leg	2	3.4	9.1
Vascular access	4	2.3	13.9
Impending graft failure	4	2	4.6
Lifestyle/work	12	8.3	19.9
All patients		4.2	6.5

Table II

Waiting Times for Patients (Percentages) Scheduled to Undergo Various Vascular Surgical Procedures

Procedure	Time, d			
	< 7	7–13	14–27	> 27
Carotid artery stenosis				
Symptomatic	22	30	27	21
Asymptomatic	20	18	24	38
Abdominal aortic aneurysm	22	25	21	32
Ischemic limb	43	23	9	25
Vascular access	37	31	23	9
Bypass failure	40	9	32	19
Lifestyle/work	8	13	16	63
Average all procedures	27	21	22	30

No patients with limb-threatening ischemia required amputation as a result of waiting for surgery. One patient with impending graft failure suffered bypass graft thrombosis while waiting for surgery longer than the benchmark waiting time. He required a more extensive procedure for limb salvage than would have otherwise been necessary. No patients waiting for vascular access procedures or with lifestyle- or work-limiting conditions suffered irreversible complications while waiting.

DISCUSSION

Waiting for necessary surgery involves more than inconvenience. There can be significant risks from delay of treatment when the disease process is life threatening or disabling. For instance a patient with an aortic aneurysm usually remains asymptomatic until the time of rupture, which is usually fatal. Similarly, a patient with TIAs and carotid artery stenosis may have sudden onset of a disabling or fatal stroke while waiting for CEA.

What may be considered an acceptable waiting time to obtain definitive surgical care depends on the disease being treated, the severity of the disease and the perspective from which it is seen (e.g., patient or health care provider). We have developed a tool to measure maximum acceptable waiting times for vascular surgery that is based on the natural history of the disease being treated and the risks of death or disability during the waiting period. Although appropriate waiting periods are given (Table I), these are not definitive or absolute as patient populations are not homogeneous, and patients present at varying stages in the progression of their disease. Rather, these parameters are intended as guidelines based, where possible, on the natural history of each condition. For several of the disease categories used in this study, accurate estimates of natural history do not exist,

and so a waiting time was determined from existing literature, experience and clinical consensus. This approach has been used to determine acceptable waiting times for coronary bypass surgery.¹⁹ Since patients are generally not denied treatment nor allowed to suffer unnecessary complications of their disease, a well-matched control group could not be obtained for this study, thus making the known natural history of the disease the only reasonable control for comparison.

Our results show that of the 554 patients, 382 (69%) were admitted within the prescribed benchmark time. No similar studies could be found for comparison, but our findings indicate that almost one-third of our patients did not receive care at the standard to which it should be delivered in order to prevent complications from their disease. Specifically, we found that patients suffered irreversible complications of their disease while waiting for surgery. Six patients with aortic aneurysms had aneurysm rupture, and 4 of these died. Receiving care within the defined maximum acceptable waiting time may have prevented these complications. Four of these 6 patients had rupture within what we thought

was an acceptable waiting period for this condition. From this study it appears that our defined acceptable waiting period of 4 weeks for aneurysm surgery is still too long (3.5% mortality while waiting for less than 4 weeks versus 2% operative mortality). Based on these data we now believe that the benchmark waiting time for aortic aneurysm repair should be 2 weeks. This death rate from aortic aneurysm rupture occurred in spite of our practice of giving priority to larger aneurysms (e.g., those 7 to 8 cm in dimension) irrespective of when they actually present. This illustrates that, size not withstanding, we could not predict and prevent aneurysm rupture in some cases.

Three patients suffered permanent strokes, which could have been prevented by more expedient care. All of these patients waited longer than our benchmark waiting time. This 3% risk of stroke while awaiting surgery is higher than the current perioperative stroke risk at our institution.²⁰ We believe the total neurologic complication rate of 11% while waiting for CEA for symptomatic carotid artery stenosis is unacceptably high.

These complications are of great

Table III

Proportion of Patients Who Underwent Vascular Surgical Procedures Within the Benchmark Waiting Times

Procedure	Benchmark target, wk	Met, no. of pts	Total no. of pts	%
Carotid artery stenosis				
Asymptomatic	2	57	100	57.0
Symptomatic	4	57	88	64.8
Abdominal aortic aneurysm	4	59	84	70.2
Ischemic leg	2	94	136	69.1
Vascular access	4	44	48	91.7
Bypass graft failure	4	10	12	83.3
Lifestyle/work	12	61	86	70.9
Total		382	554	69.0

Met = patients who were admitted within the benchmark target time, total = number of patients entered into each category during the study period.

concern because they are not related to the quality of medical care but rather to an inability to access medical care. The findings of increased morbidity and mortality for patients who wait longer than a predetermined acceptable benchmark time have also been shown in patients waiting for coronary artery bypass.²¹ Morgan and colleagues²¹ showed a death rate while waiting for coronary artery bypass in Ontario of 0.48%, with increased risk if patients waited longer than the predetermined maximum waiting period. Although our study involved fewer patients, a death rate of 5% for patients waiting for aneurysm surgery is much higher than that reported by Morgan and colleagues.

Our average waiting period for vascular surgery procedures varied from 2 to 8.3 weeks, depending on the disease and procedure, with an overall average of 4.2 weeks. The British Columbia Ministry of Health²² recently published a survey of province-wide surgical waiting lists, showing an average wait for vascular procedures of 1.7 weeks. We believe our vascular practice is representative of province-wide vascular care, and the periods of study were similar, but our figures are quite different from those of this government study.

We studied only patients who were actually admitted to hospital for vascular surgery care or who had a major complication while awaiting surgery. We believe this included all vascular patients who were placed on the waiting list during the study period.

The patient experiences more than just the waiting time for surgery that we analysed. The patient must also wait for surgical consultation and for preoperative investigations. These periods were not part of our study, but add to the total wait for care.

An overall average wait of 4.2 weeks for surgery may not seem excessive, but it must be remembered that most of these patients were being treated for life-threatening and severe

disability-threatening conditions. The complications that occurred during the waiting period were serious and potentially preventable. Most, but not all, the complications occurred in patients waiting longer than the defined acceptable benchmark waiting time.

Serious, preventable complications in patients waiting for surgery have ethical and legal ramifications for physicians and hospitals. Who is liable for these complications? Is the physician's liability for these complications absolved because he or she is unable to admit a patient for care? Should the hospital do any elective surgery for less urgent problems, while patients with potentially fatal conditions are waiting? Are these complications truly preventable or is this the best we can do with limited resources? These are health policy and legal questions yet to be answered.

At our institution, we are continuing to analyse waiting times to surgical care for these vascular conditions. Because of the unexpectedly high complication rates in this study for patients with aortic aneurysms and symptomatic carotid artery stenosis, we are making efforts to treat all of these patients within the benchmark time. We do not know if this will make other patients wait longer, or whether higher complication rates from waiting will result in patients with other diseases.

Over the years, a great deal of effort and resources have been expended to reduce the risks of complications from surgical procedures. It therefore seems somewhat paradoxical that we now place patients at risk for complications of their disease by forcing them to wait for surgery. If an intervention as simple as reducing the amount of time that a patient waits for surgery can prevent complications of disease, it should be considered worthy of attention and resources. The topic of surgical waiting lists is associated with much emotion and political

overtones but very few facts. We feel that our analysis can serve as a model for others to help define what is appropriate access to care in Canada.

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