Chapter 9: Systematic review on health related quality of life after revascularisation and primary amputation in patients with critical limb ischemia

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Abstract

Objective: To investigate the effect of revascularisation (bypass surgery, angioplasty) and primary amputation on health related quality of life (QoL) in patients with critical limb ischemia (CLI; resting pain or tissue loss)

Methods: A systematic review of the literature was performed through an electronic search in Pubmed (from 1985 to 2012) and Embase (from 1985 to 2012) by two independent investigators to identify articles in the English literature investigating health related QoL in regard to CLI.

Results: Three observational studies were identified describing a comparison between primary amputation and revascularisation and their effects on QoL in patients with CLI, all concluding that revascularisation should be attempted. Due to the impossibility to combine outcome parameters data pooling was omitted. A separate analysis of each article is presented.

Conclusions: Patients suffering from CLI have poor health prospects and life expectancy, irrespective of what treatment is received. Randomized trials on health-related QoL after revascularisation versus primary amputation are missing. Also, the available observational studies do not allow sound conclusions, due to small numbers and methodological imperfections. Therefore, no recommendations to either therapy in patients with CLI can be made, with respect to an anticipated benefit in QoL.
Introduction

The estimated incidence of critical limb ischemia (pain at rest or tissue loss; CLI) in western countries is approximately 50-100 per 100,000 persons per year, representing a major burden on healthcare and social care resources. [1] Despite advances in medical therapies and preventive strategies, the number of patients requiring lower limb revascularisation for CLI is expected to grow due to the ageing of populations, continuing nicotine abuse and the increasing prevalence of diabetes with its related vascular complications. [2,3]

The goal of treatment in patients with critical limb ischemia is to reduce discomfort, increase mobility and to improve their community-based functional status, or to preserve or reinstate their premorbid functional status. These purposes may be served with either limb salvage or primary amputation. In a considerable number of these patients, attempts at revascularisation will lead to a prolonged hospital stay with multiple operations and associated complications, costs and loss of quality of life (QoL). Despite such numerous efforts to salvage the affected limb, many of these patients will undergo an amputation above ankle level in the end, or fail to become ambulatory despite limb salvage. [4] Because CLI is reflective of systemic atherosclerosis, the morbidity and mortality of this disease and its treatment is high. [5,6] Although successful revascularisation has been associated with an improvement of QoL in patients with CLI, [7,8] functional outcome is not solely determined by the traditional, physician-oriented measures of reconstruction patency and limb salvage, but also by patient comorbidities. [9] Factually, successful revascularisation does not warrant full functional capacity. [10] Therefore, the question arises whether revascularization indeed improves QoL (that is, improve the patient’s ability to enjoy normal activities of life) when compared with major limb amputation in selected patients. In order to address this issue of prolonged post-operative morbidity without significant benefit, subsets of
patients who may be best helped by primary amputation have been
determined previously. [11]
The aim of the present study was to perform a systematic review of
literature on QoL in patients with CLI treated with primary amputation
compared to any form of revascularisation.

Methods

Search strategy

An electronic literature search was performed in Pubmed (from 1985 to
2012) and Embase (from 1985 to 2012) by two independent investigators
(J.B. and A.C.V.) to identify articles in the English literature investigating
health related QoL with regard to CLI. The period 1985-2012 was arbitrarily
chosen, because it was considered plausible that the perception of ‘quality
of life’ in the 60’s and 70’s was fundamentally different than in more recent
years. Search terms were determined describing the patient population
(pain at rest, tissue loss), the intervention (primary amputation above ankle
level), the controls (any type of revascularisation) and outcome (health
related quality of life) and combinations of these search terms (table 1).
The bibliographies of relevant articles were screened to obtain additional
articles that were not retrieved by the electronic search.

Inclusion and exclusion criteria

Prospective and retrospective, comparative studies evaluating QoL in
patients with CLI who had an (operative) intervention were considered. We
only included articles that described a comparison between patient groups
undergoing primary amputation and any form of revascularisation (open
surgical, percutaneous or hybrid intervention) for the outcome parameters
QoL, walking capability and normal activities of life. Articles in any language other than English and reviews were rejected.

**Study selection and analysis**

After identifying relevant studies, the abstracts were judged by two reviewers (J.B. and A.C.V.). The final decision regarding inclusion was based on the full article. The intention was to perform a meta-analysis by means of data pooling.

| Patients          | Critical ischemia  
|                  | Tissue loss  
|                  | Gangrene  
|                  | Rest pain  
|                  | Resting pain  
|                  | Fontaine 3  
|                  | Fontaine 4  
|                  | Rutherford IV  
|                  | Rutherford V  
|                  | Rutherford VI  
| Intervention      | Primary amputation  
|                  | Above knee amputation  
|                  | Below knee amputation  
|                  | Through knee amputation  
| Controls          | Bypass surgery  
|                  | Bypass grafting  
|                  | Endarterectomy  
|                  | Angioplasty  
|                  | Subintimal angioplasty  
|                  | Percutaneous Intentional Extraluminal Recanalization (PIER)  
|                  | Stenting  
|                  | Endovascular therapy  
| Outcome           | Quality of life  
|                  | Walking capability  
|                  | Normal daily activities  

Table 1. Search terms.
Results

Combining the search terms (table 1) resulted in the identification of 36 articles in Pubmed [4,12-46], of which 11 were reviews, one was in Japanese and one in Slovak, leaving 23 articles. After screening of titles and abstracts, 21 were omitted for different reasons, leaving two suitable articles [12,13]. The Embase search using identical terms yielded two articles, of which one was a double [4] and one was a review [47]. The rejected articles are displayed in table 2.

A search of the bibliographies resulted in the identification of three more articles of which one was suitable [48], yielding a total of three articles describing a comparison between primary amputation and revascularization, found eligible for this review. (Table 3) In these articles, a total of 300 patients was reported. No randomized controlled trials were available.

Due to different outcome parameters (all studies used different, incomparable tools to measure QoL and functional capacity) it was not possible to pool the data for meta-analysis. The three studies will be discussed in detail.
<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Therapies compared</th>
<th>Study design</th>
<th>Reason for rejection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ouma [38]</td>
<td>2012</td>
<td>Review</td>
<td>Probabilistic Markov model of a retrospective cohort for cost-effectiveness analysis</td>
<td>No QoL assessment performed</td>
</tr>
<tr>
<td>Conte [40]</td>
<td>2012</td>
<td>Patency of tibial prosthetic bypass vs. without distal vein patch</td>
<td>Retrospective study</td>
<td>No QoL assessment performed</td>
</tr>
<tr>
<td>Klepanec [42]</td>
<td>2012</td>
<td>Comparison of intramuscular and intraarterial delivery of stem-cell therapy in CLI patients</td>
<td>Randomized trial</td>
<td>No QoL assessment performed</td>
</tr>
<tr>
<td>Lawall [43]</td>
<td>2012</td>
<td>No comparison of therapies</td>
<td>Randomized trial to assess the effect of bypass occlusion on QoL</td>
<td>Patients with a primary amputation were not studied.</td>
</tr>
<tr>
<td>Kruidenier [45]</td>
<td>2011</td>
<td>Angioplastie with vs. without supervised exercise therapy</td>
<td>Randomized clinical trial to evaluate the effect of treatments on walking capability</td>
<td>Patients with a primary amputation were not studied.</td>
</tr>
<tr>
<td>Sultan [46]</td>
<td>2011</td>
<td>No comparison of therapies</td>
<td>Retrospective patient series</td>
<td>No QoL assessment performed, no comparison of QoL between amputees and non-amputees</td>
</tr>
<tr>
<td>Murphy [16]</td>
<td>2011</td>
<td>No comparison of therapies</td>
<td>Phase 1 clinical trial</td>
<td>No comparison of QoL between amputees and non-amputees</td>
</tr>
<tr>
<td>Health Quality Ontario [37]</td>
<td>2010</td>
<td>Review</td>
<td>Retrospective series of distal bypass grafting in 17 diabetics</td>
<td>No QoL assessment performed</td>
</tr>
<tr>
<td>Khalifa [17]</td>
<td>2009</td>
<td>No comparison of therapies</td>
<td>Retrospective series of distal bypass grafting in 17 diabetics</td>
<td>No QoL assessment performed</td>
</tr>
<tr>
<td>Sultan [18]</td>
<td>2009</td>
<td>Surgical bypass and subintimal angioplasty</td>
<td>Prospective comparitive study</td>
<td>No comparison of QoL between amputees and non-amputees</td>
</tr>
<tr>
<td>Lumdsen [19]</td>
<td>2009</td>
<td>No comparison of therapies</td>
<td>Prospective series of patients undergoing PTA for claudication or CLI</td>
<td>No comparison of QoL between amputees and non-amputees</td>
</tr>
<tr>
<td>Virkkunen [20]</td>
<td>2008</td>
<td>No comparison of therapies</td>
<td>Prospective series of patients undergoing PTA for claudication or CLI</td>
<td>No comparison of QoL between amputees and non-amputees</td>
</tr>
<tr>
<td>Abdelsalam [21]</td>
<td>2008</td>
<td>No comparison of therapies</td>
<td>Prospective series of patients undergoing PTA for claudication or CLI</td>
<td>No comparison of QoL between amputees and non-amputees</td>
</tr>
<tr>
<td>Sajid [36]</td>
<td>2008</td>
<td>No comparison of therapies</td>
<td>Prospective series of patients undergoing PTA for claudication or CLI</td>
<td>No comparison of QoL between amputees and non-amputees</td>
</tr>
<tr>
<td>Nguyen [22]</td>
<td>2007</td>
<td>No comparison of therapies</td>
<td>Retrospective study of patients undergoing infrainguinal bypass grafting, to determine predictors for wound complications</td>
<td>No comparison of QoL between amputees and non-amputees</td>
</tr>
</tbody>
</table>

Table 2. Rejected articles. * Double, identified in both the Pubmed and Embase search. ** Identified via Embase.
<table>
<thead>
<tr>
<th>Author</th>
<th>Therapies compared</th>
<th>Study design</th>
<th>Reason for rejection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berceli [23]</td>
<td>Surgical and endovascular revision of infrainguinal vein bypass grafts</td>
<td>Cohort study</td>
<td>No comparison of QoL between amputees and non-amputees</td>
</tr>
<tr>
<td>Sottiurai [4]*</td>
<td>2007</td>
<td>Review</td>
<td></td>
</tr>
<tr>
<td>Mondek [24]</td>
<td>2006</td>
<td>In Slovak</td>
<td></td>
</tr>
<tr>
<td>Kalbaugh [14]</td>
<td>2006 No comparison</td>
<td>Prospective series of patients undergoing PTA for claudication or CLI</td>
<td>No comparison of QoL between amputees and non-amputees</td>
</tr>
<tr>
<td>Adam [15]</td>
<td>2005 Surgical bypass and PTA for severe lower limb ischemia</td>
<td>Multicentre, randomized controlled trial</td>
<td>No comparison of QoL between amputees and non-amputees</td>
</tr>
<tr>
<td>Van Damme [25]</td>
<td></td>
<td>Review</td>
<td></td>
</tr>
<tr>
<td>Brevetti [26]</td>
<td>2002</td>
<td>Review</td>
<td></td>
</tr>
<tr>
<td>Feinglass [27]</td>
<td>2000</td>
<td>Review</td>
<td></td>
</tr>
<tr>
<td>Parkinson [35]</td>
<td>1998 Patency of PTFE graft plus distal anastomotic vein cuff vs. PTFE graft without cuff</td>
<td>Retrospective study of 50 patients</td>
<td>No QoL assessment performed</td>
</tr>
<tr>
<td>Isiklar [28]</td>
<td>1997</td>
<td>Review</td>
<td></td>
</tr>
<tr>
<td>Iwai [29]</td>
<td>1996</td>
<td>In Japanese</td>
<td></td>
</tr>
<tr>
<td>Mills [30]</td>
<td>1995 No comparison</td>
<td>Retrospective series of patients undergoing popliteodistal bypass grafting</td>
<td>No QoL assessment performed</td>
</tr>
<tr>
<td>Archie [31]</td>
<td>1994 Saphenous vein versus PTFE infrainguinal grafting</td>
<td>Retrospective comparative study</td>
<td>No QoL assessment performed</td>
</tr>
<tr>
<td>Motarjeme [32]</td>
<td>1993 No comparison</td>
<td>Retrospective series of patients undergoing thrombolysosangioplasty as an alternative for major amputation</td>
<td>No QoL assessment performed</td>
</tr>
<tr>
<td>Loh [33]</td>
<td>1993 PTFE bypass to the popliteal artery, with or without distal vein patch</td>
<td>Retrospective, comparative study</td>
<td>No QoL assessment performed</td>
</tr>
<tr>
<td>Gupta [34]</td>
<td>1988 Economic evaluation of patients with CLI undergoing primary amputation or bypass grafting</td>
<td>Retrospective, comparative study</td>
<td>No QoL assessment performed</td>
</tr>
<tr>
<td>Brooks [47]**</td>
<td>2008</td>
<td>Review</td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Rejected articles, continued.
<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>N</th>
<th>Patients compared</th>
<th>QoL assessment tool</th>
<th>QoL domains investigated</th>
<th>Study design</th>
<th>Objective</th>
<th>Result</th>
<th>Recommendation</th>
<th>Level of evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thompson [12]</td>
<td>1995</td>
<td>112</td>
<td>Femorodistal bypass and primary amputation</td>
<td>Hospital Anxiety and Depression Scale [65], non-specified scales for mobility and social functioning</td>
<td>Anxiety, depression, social functioning, mobility</td>
<td>Retrospective comparative study</td>
<td>To compare QoL after revascularization versus primary amputation in patients with CLI.</td>
<td>Patients undergoing amputation after failed revascularization had the same QoL than those having primary amputation. Patients with functioning bypass had less impairment of QoL than those undergoing primary amputation or amputation after failed revascularization.</td>
<td>Revascularization should be attempted</td>
<td>3b</td>
</tr>
<tr>
<td>Johnson [13] *</td>
<td>1997</td>
<td>150</td>
<td>Successful angioplasty, successful thrombolysis/thrombectomy, successful surgical bypass, amputation after failed revascularization, primary unilateral amputation, primary bilateral amputation.</td>
<td>Burford thermometer [66], a graded mobility scale [67], the Hospital Anxiety and Depression Scale [65], the Barthel Index [68], the Frenchay Score [69]</td>
<td>Pain, mobility, anxiety, depression, functional activity, lifestyle</td>
<td>Prospective, observational study of patients with CLI</td>
<td>Assessment of QoL after treatment for CLI</td>
<td>Overall QoL better after limb salvage. Failed revascularization leading to amputation leads to poor lifestyle performance, equal to those undergoing primary amputation.</td>
<td>Revascularisation after determination of individual lifestyle requirements and technical aspects of the proposed revascularisation</td>
<td>2b</td>
</tr>
<tr>
<td>Albers [48]</td>
<td>1996</td>
<td>38</td>
<td>Arterial reconstruction and below-knee amputation</td>
<td>Local score [70], Spitzer QL-INDEX [71]</td>
<td>Walking ability, occupation, activities of daily living, perception of own health, support from family and friends, outlook on life.</td>
<td>Cohort study</td>
<td>To compare QoL and walking ability after revascularization versus primary amputation in patients with CLI, at 3, 6 and 12 months.</td>
<td>Walking ability was better after arterial reconstruction at 3, 6 and 12 months; QoL was better after arterial reconstruction at 3 months.</td>
<td>Arterial reconstruction should be attempted, at least in patients with an intact contralateral limb, free of stroke.</td>
<td>2b</td>
</tr>
</tbody>
</table>

Table 3. Selected articles. N: number of patients included. * Double, identified in both the Pubmed and Embase search.
The first study (Thompson, 1995) directly assessed QoL following infragenicular bypass versus primary limb amputation in patients with CLI. In this retrospective study a group of 112 patients who had previously undergone femorodistal bypass (n=86) or primary amputation (n=26) between 1988 and 1993 was sent a self-assessment questionnaire, measuring anxiety, depression, social functioning and mobility. QoL was defined as the summoned total of all these scores. Revascularisation was always preferred, but some patients underwent primary amputation because of extended necrosis, a premorbid inability to ambulate or severe dementia. 82 patients responded. 38 % had primarily patent bypass, 21 % had a secondarily patent bypass, 21 % had an amputation after bypass failure and 21 % had a primary amputation. Patients with an attempt at revascularisation had lower levels of depression (p=0.04), less impairment of social functioning (p=0.01) and greater mobility (p<0.001) as compared with those having a primary amputation. There was no difference in the totals of summoned scores between patients with a primarily or secondarily patent graft. Also, there was no difference between patients with a primary or secondary amputation. Patients with patent grafts had a better total of summoned scores than amputated patients (p<0.001). It was concluded that revascularisation therefore should always be attempted.

[12]

A prospective observational study among 150 consecutive patients (Johnson, 1997) investigated the effect on QoL (measured with separate tools for pain, mobility, anxiety, depression, self-care and lifestyle) of 6 different treatment outcomes (angioplasty, thrombolysis/thrombectomy, surgical bypass, amputation after failed revascularisation, primary unilateral amputation and primary bilateral amputation) at 6 and 12 months as compared with QoL at presentation. All patients were considered for revascularisation. Only those with an anticipated poor outcome were offered primary amputation.
Pain improved for all groups (p<0.05), except for those with failed revascularisation (p=0.08). Mobility improved in those treated with angioplasty (p<0.05) and surgical bypass (p=0.001). Anxiety and depression improved only after successful surgical reconstruction (p<0.02). Lifestyle was maintained in all groups except thrombolysis/thrombectomy and failed surgical reconstruction. Self care ability improved significantly after angioplasty (p<0.05) and surgical reconstruction (p<0.005), but also after unilateral primary amputation (p<0.05). The significant improvement in activities of daily living (ADL) achieved in unilateral amputees suggests that good rehabilitation can lead to independent function, and is not necessarily incompatible with a high level of self-care ability. It was concluded that limb salvage in the treatment of CLI will result in better QoL than primary amputation. [13]

Another small study of 38 patients undergoing arterial reconstruction or primary amputation (Albers, 1996) compared walking ability and QoL as measured with a subjective local scale and the Spitzer QL-index, respectively at 3, 6 and 12 months. Predictably, walking capacity was superior in those undergoing arterial reconstruction. QoL was better in the arterial reconstruction group at 3 and 6 months, but this advantage had disappeared at 12 months. [48]

**Discussion**

Although the observational studies reviewed in this report suggest a QoL benefit from revascularisation when compared with primary amputation, there is no sound evidence available to support this opinion. Also, the observed advantage of revascularisation in comparison with amputation is probably only temporary. Amputation after revascularisation is associated with a catastrophic decline in QoL, and premorbid state heavily influences the post-operative functional outcome. These findings stress the necessity
of the determination of a more specific set of criteria to identify patients that are better off with primary amputation than with revascularisation. It becomes clear that the use of general criteria, such as those proposed by the Transatlantic Inter-Society Consensus on the Management of Peripheral Arterial Disease [11] leads to a mediocre patient selection at best.

Up until the 21st century, the discussion on patient selection for primary amputation or revascularisation has been dominated by physician-oriented rather than patient-oriented outcomes. [49] As it appears, there has been a paucity of data on therapy-related QoL in patients with CLI since the mid-90’s. The evidence available to support revascularisation in patients with CLI to improve QoL is weak. So, some remarks on the results of these reports are justified.

In the study by Thompson, selection bias is a major issue. Patients were always considered for revascularisation, but excluded for revascularisation when major tissue loss, premorbid inability to ambulate or dementia was present. Firstly, major tissue loss excludes the most difficult-to-treat patients from the revascularisation group, hence directly influencing the rate of successful healing, the secondary amputation rate and subsequently the chances of successful rehabilitation in the revascularisation group. Additionally, it is clear that the exclusion of all immobile patients from the revascularisation group and assigning them to the amputation group influences mobility assessment. The fact that a primary QoL parameter (mobility) is being so heavily influenced by the assignment of patients to a certain treatment is a major source of bias. Secondly, dementia was used as an exclusion criterion for revascularisation. However, dementia as such is very likely to pose a threat to the reliability of QoL measurements in general, and in particular when self-assessment tools are used, as was done in this study. Boldly stated, this will lead to reliable QoL measurements in the revascularisation group and to unreliable measurements in the amputation group. Thirdly, it is an established fact that dementia is a predisposing factor for the occurrence of anxiety and depression, and is
obviously a limiting factor in social functioning. All of these variables were used as primary outcome parameters within the QoL assessment method. The fact that all demented patients (being more prone to depression) were assigned to primary amputation leads to significant selection bias, directly influencing the outcome of this study. It is very likely that QoL of the (highly selected) patients in the revascularization group was better already before operation.

Finally, QoL was assessed with a locally constructed “overall index”. A summation of scores of different, non-related QoL tools was used to obtain this score. However, this overall index represents a summoned value of scores of incomparable concepts and measures. The methodological flaws in this study disqualify its conclusion that revascularisation should always be attempted based on the better QoL outcomes presented. Based on this study, no recommendations can be made. [12]

The study by Johnson reports on expected improvements in mobility and pain after successful revascularisation. The results of this study are compromised by selection bias: all patients were considered for revascularization. Primary amputation, however, was performed only if “the prospect of vascular reconstruction was hopeless”. It does not become clear which criteria (e.g., comorbidities, operative risk, vascular imaging) define “hopeless”.

They found that a failing revascularisation introduces a serious threat to patient wellbeing: Pain improved in all patients except those with failed revascularisations. Lifestyle deteriorated after failed bypass, in contrast with the lifestyle of patients having a primary amputation. Self-care and activities of daily living improved significantly after primary unilateral amputation.

The items assessed were pain, mobility, functional status, the home situation and anxiety and depression.
This study emphasizes that premorbid state influences the postoperative functional outcome, even after failed bypass and secondary amputation. Considering the fact that bypass patency in patients with CLI is limited [50], this study implicitly calls for the determination of better selection criteria to identify those patients that will benefit from primary amputation rather than revascularisation. The authors conclude that revascularization leads to a better overall QoL in patients with CLI, based on the comparison of outcomes between two very different, selected groups of patients. [13]

Albers et al. present a subset of 38 selected patients out of an originally, non-randomized, 100 patients, studied for mobility and QoL. The QoL tool used (the Spitzer Index) was originally designed for cancer survivors and is rarely used in vascular disease. Also, it is a physician-rated instrument. Of the 38 patients studied, 22 had revascularization. Of these, five had subsequent major amputation after bypass failure and four died in the 12-month follow up period. None of the 16 primary amputees died. Some amputees had a better mobility than revascularized patients. The initial QoL benefits of arterial reconstruction at 3 and 6 months had disappeared after one year. Their conclusion that patients benefit from revascularization in terms of QoL and mobility seems contradictory with the findings of the study and has no bearing on the results presented. [48]

The preference for surgical revascularisation is based on its good long-term patency and clinical durability. [51-53] The down side of this approach, however, is reflected in the pronounced associated morbidity, mortality and its substantial impact on social and medical resources, such as periodical ultrasonographic surveillance and subsequent interventions [54,55].

As everyday practice shows us, patients undergoing limb-saving vascular reconstructions require ongoing treatment and repetitive hospitalizations, and experience persistent or recurrent symptoms until their deaths. Although some degree of palliation may be achieved, combined premorbid
ambulation, complete wound healing and total relief from pain are rarely achieved.

The impact of limb saving interventions on the overall rate of amputation has proven itself hard to document. Whereas some authors found an association between a decreasing number of amputations performed and an increase in vascular surgical activities, others found no change in amputation rates, despite a significant increase in vascular procedures. [56-58] Although open bypass surgery seems to be superior to angioplasty in terms of long-term patency, this may not be the case when amputation free survival and functional outcomes are used, or when subjective QoL outcomes (such as patient satisfaction) are measured. [14,15]

Those preferring percutaneous intervention will emphasize its reduced costs, shorter hospital stay, low complication rates and the short-term availability. Moreover, claims have been made that angioplasty failure will not jeopardize the results of future surgery, and that – in contrast with a failing bypass – it preserves collaterals. [14,59-61]

As literature shows, patients suffering from CLI have poor health prospects and limited life expectancy, irrespective of what treatment is received. This observation emphasizes the need for a treatment that excludes as many risks as possible, is least likely to result in prolonged hospital stays, and is most likely to warrant a quick return home. Recently, an attempt was made to develop a scoring system to predict functional status at 1 year postoperatively. The patient-oriented outcomes investigated were basic and instrumental activities of daily living, and ambulatory and living status. Preoperative, operative and functional status characteristics and postoperative outcomes were recorded and analyzed in order to determine predictors of functional benefit (meaning: preservation or improvement) from revascularization. Considering patient-oriented outcomes, this study showed that revascularization could be worthwhile in nearly 60% of CLI patients. The proposed prediction model, however, is complex and not yet validated. [62]
Patients expected to live for 1-2 years are frequently offered angioplasty, as this is considered a low-risk intervention in this high-risk, physiologically impaired population. Also, the benefits of bypass surgery (as compared with angioplasty) become manifest after 2 years. [15] It should be noted, however, that the functional benefits of angioplasty in CLI patients who are unfit for surgery are very limited, when compared with amputation. Taylor and colleagues investigated a large cohort of CLI patients unfit for surgery, receiving percutaneous treatment as an alternative and compared them with a group of patients that had primary major amputation. It was found that the advantages of better mobility and independent living in the PTA group only lasted for 12 and 3 months, respectively and that mortality in the PTA group was significantly higher. This unexpectedly high mortality in the PTA group is in contrast with the assumption that PTA is a low-risk intervention. Although this study lacks an actual patient-oriented QoL assessment, it becomes clear that the functional benefits of percutaneous revascularization in this particular group of patients are very limited and are achieved only at the cost of significant mortality. [63] It seems obvious that the comorbidities that make a patient unfit for surgery, will also negatively influence the patient’s premorbid ambulatory status and make a lasting functional recovery after a successful revascularisation unlikely. In patients with a life expectancy exceeding 2 years, open bypass surgery is justified.

Attention should be paid to the fact that the population included in trials is a selected group of patients, since a considerable number of individuals suffering from CLI is regarded unsuitable or unfit for any form of revascularisation, or is not even offered diagnostic imaging because their disease is too advanced or their condition is too poor. The true dimensions of the population of patients represented by those included in trials therefore remain undefined. This implies that trial results are not unrestrictedly applicable to all patients with CLI. Primary amputation may well be the best option for a greater number of patients than is assumed.
Data on subjective outcomes (such as patient satisfaction) and QoL in relation to different techniques of lower limb revascularisation as compared with primary amputation in patients with CLI are scarce. QoL measurements are being performed with a wide range of validated, non-validated, local, disease specific and generic instruments, making comparison between studies very difficult. [64-71] Additionally, patients with peripheral arterial disease suffer from a wide array of comorbidities, present in different degrees of severity – all representing considerable factors of bias with respect to both QoL and mobility measurements. The studies reviewed conclude that revascularisation probably should be preferred in the general population of patients suffering from CLI. This conclusion, however, is hardly supported by the results from these investigations, and appears to be merely intuitive. It is evident that there is a considerable subgroup of individuals that will not benefit from revascularisation in terms of QoL or mobility because of comorbidities or a limited life expectancy, and is probably better off with primary amputation. Unfortunately, up to now no specific criteria have been identified that may be of help in selecting these patients for primary amputation. The available observational studies do not allow sound conclusions, due to small numbers, bias and methodological imperfections. Therefore, no recommendations to either therapy in patients with CLI can be made.
References

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