



LOWER LIMB AMPUTATION FOR CHRONIC PAIN AND/OR FUNCTIONAL IMPAIRMENT

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Objective: To evaluate the impact of a lower limb amputation for chronic pain and/or functional impairment on pain and participation in daily living activities and to assess the use of prostheses. To improve decision-making for this controversial treatment.

Design: Survey.

Setting: University hospital.

Subjects: Patients who had an amputation of a lower limb for chronic pain and/or functional impairment.

Results: Eighty-one percent of the patients were satisfied with the amputation and would decide to undergo an amputation again under the same conditions. Sixty-nine percent of the patients reported an improvement in pain, 69% an improvement in mobility, 75% in daily living activities, and 56% an improvement in sleep. Seventy-five percent of the patients used their prosthesis on a daily basis.

Conclusion: Most patients who underwent an amputation in our hospitals for chronic pain and/or functional impairment of a lower limb were satisfied and reported an improvement in function and pain.

Key words: amputation; chronic pain; functional impairment; complex regional pain syndrome.

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Therapeutic decision-making for chronic pain and/or functional loss in a lower limb is a complex problem. Patients who have been experiencing pain and/or loss of function in a lower limb sometimes consult for further treatment options. The aetiology of their problem is often very diverse. When the lower limb has become non-functional it creates a major impediment to daily functioning. Current guidelines on pain mention analgesics and physiotherapy, as well as more invasive treatments, such as sympathetic block, intrathecal drug infusion and spinal cord stimulation (1). Despite this range of treatments, a small number of patients still experience a lot of pain and/or functional loss. Some of these patients request an amputation.

Decision-making regarding amputation in this population is a complex and controversial process, since it is an irreversible treatment. There is limited literature about the

LAY ABSTRACT

Therapeutic decision-making for chronic pain and/or functional loss in a lower limb is a complex problem. Many articles have been devoted to chronic pain, and current guidelines mention a lot of treatment options. However, patients can still experience a lot of pain and/or functional loss after having tried many treatments. Some of these patients request an amputation. Most physicians refrain from this treatment, since it is very drastic, irreversible, and there is a lack of evidence regarding the outcome. To our knowledge only a few case reports and a select number of case series have been published to date about amputation for chronic pain and/or functional loss in a lower limb, and these show variable results. This study followed a small group of patients in University Hospitals Leuven, Belgium, who underwent a lower limb amputation for this complex problem. Most of these patients were satisfied with their amputation. They reported an improvement in function and pain, and would decide to undergo an amputation again under the same conditions.

effect on pain, including the risk of phantom pain and the impact on daily living activities. The aim of this retrospective study was to analyse the outcome of an amputation on pain, daily functioning, mobility and quality of life in patients who underwent amputation of a lower limb for chronic pain and/or functional loss in our hospital.

METHODS

A database of 799 patients who underwent an amputation in our hospital between January 1999 and March 2019 was searched. Inclusion criteria were: elective amputation of a lower limb for chronic pain and/or a non-functional limb, age 18 years or older, a minimum follow-up of one year, and a non-urgent or non-vital motive for the amputation. Chronic pain was described as pain of any aetiology, not associated with neoplastic disease, associated with a chronic medical disorder, and negatively affecting the well-being of the individual (1). Exclusion criteria were: diabetes mellitus and peripheral vascular occlusive disease, amputation of an upper limb, and French-speaking patients.

An online survey was sent to all 21 included patients by e-mail. It was a non-validated survey based on the Groningen Questionnaire Problems after Leg Amputation (GQPLA) (2) and the World Health Organization Quality of Life – BREF (WHOQOL-BREF) (3). The survey enquired about the presence of pain before and after amputation, the functional state of the patient, the use of a prosthesis, quality of life, and if they would undergo the amputation again under the same circumstances.

The patient's medical records were reviewed for pain management before the amputation and to evaluate the screening methods that had been used to give advice regarding the amputation.

Descriptive statistics were used to analyse the results. The research protocol was validated by the local medical ethics committee (Medical ethics Committee, Universital Hospital KU Leuven/Commissie Medische Ethiek, Universitaire Ziekenhuizen KULeuven).

RESULTS

A total of 28 patients had an amputation for chronic pain and/or functional impairment. Of these, 7 patients were excluded from the study, due to death ($n=2$), French-speaking ($n=2$), amputation of upper limb ($n=1$), or lack of personal data ($n=2$). A final total of 21 patients were included in the study. A flowchart of patient selection is shown in Fig. 1.

A total of 16 patients completed the survey: 9 men and 7 women, median age 55.5 years. All 16 patients were examined by a physical and rehabilitation medicine (PRM) physician and an orthopaedic surgeon prior to the amputation. Eleven patients were screened by a multiprofessional pain team in our hospital. Patient characteristics are shown in Table I.

Prior to the amputation All 16 patients received physiotherapy, classic pain medications and anti-inflammatory drugs. Nine patients were receiving morphine, 7 patients antidepressants, and 6 patients anticonvulsants. Three patients were receiving anti-

anxiety agents and one patient had an infusion with lidocaine hydrochloride monohydrate. Two patients used transcutaneous electrical nerve stimulation (TENS) and 2 patients underwent a sympathetic block. A neurostimulator was implanted in 2 patients.

Pain

Of the 16 respondents, 11 (69%) reported a decrease in pain after the amputation. All of these 11 patients reported a score of 6 or more out of 10 on the numerical rating scale (NRS) for pain before the amputation. Seven patients reported a major reduction in pain (of at least 5 points on the NRS). Three patients reported no change in pain and 2 reported an increase in pain. Thirteen patients experienced residual limb pain and 14 had phantom pain and phantom sensations. Impediments due to this pain are shown in Table I. Six patients received treatment with medication for residual limb pain (antidepressants and anticonvulsants), which had a positive effect in 5 patients. Nine patients were treated for phantom pain. Therapy consisted of medication (antidepressants and anticonvulsants), mirror therapy, hypnosis and psychological support. A neurostimulator was implanted in one patient post-amputation.

Mobility and use of a prosthesis

Of the 16 respondents reported an improvement in their mobility, 1 patient reported no change and 4 reported a deterioration in mobility. Prostheses were used by 8 patients during more than 8 h a day, by 4 patients during 4–8 h a day, and by 2 patients during less than 4 h a day. Two patients never used their prosthesis. Three patients (2 with a transtibial amputation and 1 with a transfemoral amputation) could walk more than 5 km with their prosthesis without any walking aid. Three patients with a transfemoral amputation could walk between 1 and 5 km, 1 patient using a cane. Five patients with transfemoral amputation could walk 500 m – 1 km, and 3 of them

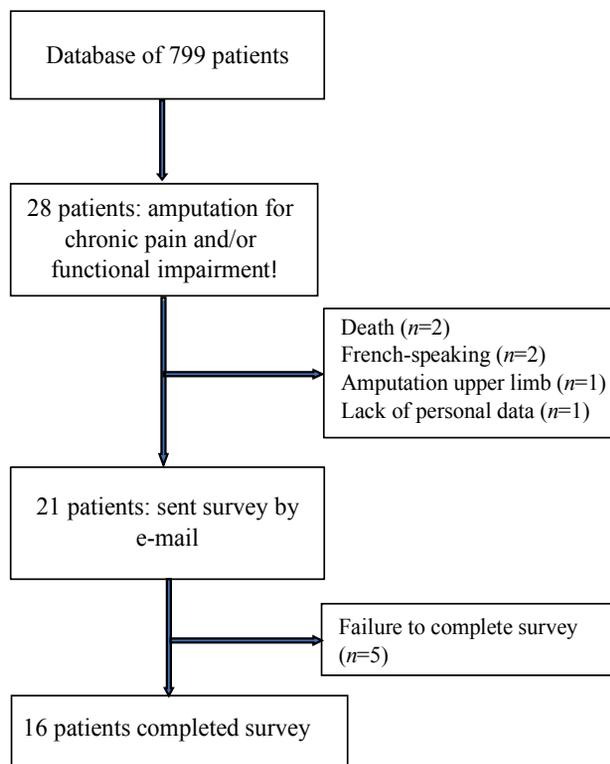


Fig. 1. Patient selection flowchart.

Table I. Patients' characteristics

Characteristics	n
Sex	
Male	9
Female	7
Amputation type	
Transfemoral	12
Transtibial	4
Underlying health condition	
CRPS-1	5
Trauma	9
Chronic infection	2
Duration of pain before amputation	
> 1 year	14
6 months – 1 year	1
No pain	1

CRPS-1: chronic regional pain syndrome type I.

Table II. Pain and impediment

Pain and impediment	Total (n = 16)
Residual limb pain, n	13
Hardly	5
Moderate	4
Much or very much	4
Phantom sensations, n	14
Hardly	6
Moderate	4
Much or very much	4
Phantom pain, n	14
Hardly	4
Moderate	6
Much or very much	4

used a walking aid. Three patients used their prosthesis only during transfers (1 with a transtibial amputation and 2 with a transfemoral amputation). All of these 3 patients used a walking aid (Table II).

Quality of life

Twelve patients reported an improvement in their daily living activities. Two patients did not feel any change, and another 2 reported a deterioration. Nine patients reported improved performance in sport. Most of them already practiced sports before the amputation, mainly swimming and cycling. Sleep improved in 9 patients, 2 patients reported a little improvement and 5 patients reported no change.

Ten patients hardly or never experienced emotional problems after the amputation. Most of them did not have any problems before the amputation. Three patients stated that they experienced some problems a number of days per year after the amputation and one patient had mood disturbances a number of days per week. Three of them experienced some emotional problems before the amputation. Two patients reported daily mood problems before and after the amputation.

Satisfaction with decision for amputation

Thirteen patients reported that they would undergo the amputation again under the same conditions. Three patients were not satisfied: 2 patients with a transfemoral amputation and an underlying trauma, and 1 patient with a transtibial amputation and a chronic infection in the medical history. All 3 of these patients could not

Table III. Mobility

	Before amputation	After amputation
Walking	Total (n = 16)	Total (n = 16)
< 100 m	9	5
100–500 m	1	0
500 m–1 km	2	5
1–5 km	2	3
> 5 km	2	3

Table IV. Perceived changes after amputation.

Observed changes post-amputation (n = 16)	Enhancement, n No change, n Regression, n		
	Enhancement, n	No change, n	Regression, n
Pain	11	3	2
Mobility	11	1	4
Level of activity	12	2	2
Sports	9	7	0

walk more than 100 m. Two patients did not report any emotional problems before the amputation, and 1 patient reported emotional problems on a daily basis before the amputation. An overview of perceived changes after the amputation is shown in Table III and Table IV.

DISCUSSION

Amputation of a lower limb due to chronic pain and/or functional impairment is a very controversial treatment. Most physicians refrain from this treatment, since there is a lack of evidence about the outcome. To our knowledge, only a few case reports and a select number of case series have been published, with variable results.

This study shows that an amputation of a lower limb for chronic pain and functional impairment can be successful. Thirteen of 16 patients who completed the study survey were satisfied and would decide to undergo the amputation again under identical circumstances. Amelioration of pain and improved mobility were reported by most patients. Although patients were not totally pain-free, the majority of them reported minor or moderate impediment due to this pain.

Five patients underwent an amputation for Complex Regional Pain Syndrome (CRPS-I). Recurrence of CRPS was diagnosed in 2 patients. Both patients had a revision of the amputation to a higher level. Given the small number of patients with CRPS in this study, it is difficult to compare the results with the literature. Two systematic reviews from 2011 and 2019 reported, respectively, recurrence rates of 48% (4) and 46% (5) in patients with CRPS-I; however, the prominent recurrence rate was affected by the research of Die-lissen et al. (6). Krans-Schreuder et al. published a recurrence rate of 24% in a group of 21 patients who had an amputation (2) and Midbari et al. reported a recurrence rate of 32% in 19 patients (7). Despite the high recurrence rate in this study, all 5 patients were satisfied with their amputation.

Bodde et al. described the importance of a thorough psychological screening before an amputation for CRPS-I (8). This screening incorporated the use of green, yellow and red flags. The presence of green flags, such as a persistent request for amputation, adequate social support and having realistic expectations,

implied a better outcome in this selective patient population (8). Patients with a major psychological history had a poor outcome (8). A good and standardized pre-operative psychological screening seems beneficial, as well as providing detailed information about the operation, amputation level and rehabilitation (8–12). Information about the risk of residual limb pain, phantom pain and phantom sensations appears advisable. The literature shows that the presence of phantom pain in this population varies from 41% to 89% (2, 4–7, 13, 14). In the current study 88% of patients experienced phantom pain, but most of them only during a number of days per year or per month. Another paper from the Dutch group (15) stated that good resilience contributes to a better outcome. Optimization of resilience could be an important goal during the rehabilitation process, in order to improve the outcome (15).

In this study 14 of the 16 patients (88%) used their prosthesis on a daily basis, but only 12 patients reported an improvement in mobility. The 2 patients who reported no improvement used their prosthesis for less than 4 h a day and could walk only 100 m with a walking aid. They were both dissatisfied with the amputation in general. Therefore, it seems appropriate to discuss the use of a prosthesis with patients who are thinking about an amputation. A systematic review published in 2011 found that 48% of patients with a lower limb amputation used a prosthesis regularly (4). In the study by Krans-Schreuder et al., 75% used their prosthesis (2) and Midbari et al. reported a result of 53% (7); both groups investigated patients with amputation for CRPS-I. Honkamp et al. published a study of 18 patients who had an amputation for chronic pain regardless of their initial diagnosis. They reported that 89% of patients used their prosthesis regularly (13). Compared with the literature, the results of this study are above average. Concerning the level of amputation in this study, it is difficult to determine a difference in functionality between transfemoral and transtibial amputations, since there is an unequal ratio and most patients in both groups used a prosthesis on a daily basis. However, in the study by Krans-Schreuder et al. there was a clear difference, since none of the patients with a transfemoral amputation used a prosthesis (2). The other studies did not mention a difference between these groups (4, 7, 13). We would expect that patients with a transtibial amputation would have a better outcome in mobility.

In general, the literature shows the importance of detailed screening. UK guidelines from 2018 regarding the management of CRPS implements the studies of Dielissen et al. and Geertzen et al., and recommends screening by a multidisciplinary team before performing an amputation. The team should include a consultant in pain medicine, a pain specialized psychologist, a surgeon and a PRM physician (16).

Although not all the patients in this study were diagnosed with CRPS-I, this information can be applied to the results. All 16 patients were seen by a PRM physician and an orthopaedic surgeon, but only 11 patients were screened by a multidisciplinary pain team, including an anaesthesiologist-algologist and psychologist. Consequently, 5 patients did not undergo this screening, of whom 2 patients were finally not satisfied with the amputation. A more standardized pre-operative screening could therefore improve the outcome.

Study limitations

Limitations of this study are the small group of patients as well as a selection bias. Patients were only retrospectively selected from a database by a team of PRM physicians. Given the complex problem, this concerns a rare treatment, which limits the number of patients. Furthermore, randomization of patients was not possible. The results were obtained by a non-validated questionnaire, which implies that some answers could be over- or under-estimated. It is possible that patients want to justify the amputation. In addition, we do not have information about the quality of life and functioning of patients who were refused an amputation.

CONCLUSION

This retrospective study shows that amputation of a lower limb in the context of chronic pain or functional loss can be a treatment option. Most patients in this study were satisfied with the amputation and had an improvement in pain and daily functioning. This research contributes to the complex discussion concerning treatment in this group of patients. Further research is necessary to provide a better understanding of the outcome of this controversial treatment.

The authors have no conflicts of interest to declare.

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