Residual limb claudication after vascular transfemoral amputation

de Boer, Riemke G. A.; Paping, Marieke A.; Kap, Bert; Geertzen, Jan H. B.

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Riemke GA de Boer[1], Marieke A Paping[1], Bert Kap[2] and Jan HB Geertzen[3]

Abstract

Background: In all, 68% of all lower limb amputees experience residual limb pain. More than 95% of all lower limb amputations in developed countries are due to peripheral artery occlusive disease in combination with diabetes mellitus. Therefore, claudication, which is one of the most common manifestations of peripheral artery occlusive disease, should be taken into consideration in making a differential diagnosis of residual limb pain.

Case description and methods: We present a case study of a 60-year-old diabetic patient who underwent a transfemoral amputation due to peripheral artery occlusive disease and who experiences residual limb pain. A computed tomography angiography was performed, and we searched for relevant literature on claudication pain after lower limb amputation.

Conclusion: Little research has explored claudication as a cause of residual limb pain. More research will lead to a decrease in unnecessary prosthetic fittings and adjustments give more insight into the treatment and management of residual limb pain and prevent a decrease in mobility in amputees.

Clinical relevance

Claudication due to peripheral artery occlusive disease should be included as a possible cause of residual limb pain to prevent unnecessary prosthetic fittings and adjustments and to minimize psychological effects and limitations in activities and participation.

Keywords

Lower limb amputation, residual limb pain, claudication, peripheral artery occlusive disease

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Background

In the Netherlands, approximately 3300 major lower limb amputations are performed annually. Peripheral artery occlusive disease (PAOD) is the most common etiology, accounting for nearly 70% of lower limb amputations, followed by 27% due to diabetes mellitus and 3% due to trauma or oncological reasons.[1,2] The overall mortality rate is 50% in patients with PAOD at 2–5 years after the amputation.[3–7] Pain is a common problem in lower limb amputees, with 95% experiencing some form of pain. In all, 68% report residual limb pain and 46%–90% report phantom limb pain in the postoperative phase or in the longer term.[8,9] Residual limb pain negatively interferes with activities of daily living (ADL), family and social life, working ability, and psychological well-being.[10] There is a broad differential diagnosis of residual limb pain, including mechanical pain induced by problems with the prosthetic fit or alignment; referred pain; trauma-related pain after, for instance, a fall; or local pathology such as osteomyelitis, neuromas, exostoses, and claudication due to PAOD.[9]

Case description and methods

We present a case study of a 60-year-old female patient with a history of chronic obstructive pulmonary disease (Gold II), pancreatitis, a myocardial infarction treated with

[1]Rijndam Rehabilitation Centre, Rotterdam, The Netherlands
[2]Rehabilitation Center de Hoogstraat, Utrecht, The Netherlands
[3]Department of Rehabilitation Medicine, University Medical Center Groningen, University of Groningen, Groningen, The Netherlands

Corresponding author:
Riemke GA de Boer, Rijndam Rehabilitation Centre, Westersingel 300, Rotterdam 3015 LJ, The Netherlands.
Email: riemkedeboer@gmail.com

coronary artery bypass grafting, a stent graft in the left external iliac artery in 2011, diabetes mellitus type 2, PAOD, and a cerebrovascular accident in 2010 without significant residual complaints. She smoked 16 cigarettes a day on average, and she had poorly controlled blood glucose levels. The patient underwent a transfemoral amputation in November 2014 due to ischemic vascular problems and non-healing wounds on the left lower leg, which were accompanied with unbearable pain. After the amputation, the wound on the residual limb healed slowly but progressively. She experienced some phantom sensations as well as phantom pain, but these were bearable with a low dose of pregabalin. After 3 months, she was able to start the routine management of the prosthesis, and a test socket was provided. Right from the onset of training, however, she noticed residual limb pain, which she described as a nagging pain and sometimes as a stabbing feeling in the end of the stump. The pain was similar to the ischemic pain she had felt in 2011, for which a graft stent was placed in the left external iliac artery. She reported the pain to be slowly increasing over a period of 6 months after the amputation. She experienced the pain during activity and rest, regardless of whether she was wearing a liner or compression stocking (a score of 7 on a 0–10 pain scale). The pain became worse during physical activities involving her left leg (a score of 9 on a 0–10 pain scale). Therapy with acetylsalicylic acid and dalteparin did not lead to a reduction in pain, nor did attempts at risk factor modification by means of life style changes (smoking cessation, better diabetes control, a healthy diet, and weight loss). The right leg was not affected by pain. The difference in temperature on palpation was most notable: the residual limb felt cooler than the contralateral limb. Several adjustments to the socket and the suspension system over a period of 4 months had no beneficial effect on her complaints. The pain meant the patient could use the prosthesis for no longer than 10 min during therapy. Because physical activity was limited due to residual limb pain, she could not optimally improve or maintain the muscle strength needed for walking and making transfers. This, in turn, led to a wheelchair-bound life, with restrictions in mobility, limitations in ADL (mainly washing, dressing, and toileting), and a decrease in motivation to contribute to the management of the prosthesis in any form. After the patient fell on the residual limb, a standard X-ray was performed to exclude a fracture, and a computed tomography (CT) scan was performed to exclude osteomyelitis as a possible cause of her pain. Imaging revealed no abnormalities. A vascular surgeon was consulted to preclude possible vascular problems because of the symptoms experienced during rest. A CT angiography was also performed, which showed an occluded stent in the left proximal external iliac artery with significant calcification in the left superficial femoral artery (Figure 1). As her pain could be very well explained by these findings, consultation by a neurologist would have been of little additional value in ruling out a neurological cause.

Figure 1. Occlusion of the left proximal external iliac artery stent.

The vascular surgeon considered a surgical intervention to be the only option; however, a positive outcome of a revascularization could not be guaranteed due to the combination of location, the degree of stent occlusion, and comorbidities. The patient canceled her appointment with the vascular surgeon to discuss the possibility of recanalization. She did not want to undergo another surgical intervention, considering the low probability of a positive outcome and the possible surgical risks. Her mood and motivation for participating in physical training to achieve a walking ability with the prosthesis were diminished due to the pain and the futile effects of adjustments to the fit of the prosthesis.

Findings and outcomes

A search in Pubmed for relevant studies using the keywords [residual limb pain], [claudication], [peripheral artery occlusive disease], and [lower limb amputation] resulted in 30 studies. These included seven potentially relevant studies: one case report on residual limb claudication,[11] two comparative studies on diagnostic findings in the residual limb versus the contralateral limb,[12,13] and four studies on the clinical evaluation of phantom pain and residual limb pain, including differential diagnoses.[8,10,14,15] The other studies described other causes of residual limb pain (e.g. osteoporosis, osteomyelitis, or phantom pain) or focused

on the effects of several medications on non-vascular causes of residual limb pain. No additional references were sourced from the potentially relevant studies.

Very few studies included claudication due to PAOD as a possible cause of residual limb pain. Only one case report on a traumatic amputee suffering from residual limb pain was found. This patient underwent a surgical intervention with the placement of a synthetic graft, which had beneficial effects on the duration of ambulation and on the level of comfort experienced during ambulation.[11] One study on patients with residual limb pain found a significantly lower temperature in the residual limb compared with the contralateral intact limb, but this study included only a very small number of dysvascular patients with a lower limb amputation (n = 30).[12] A study on high-resolution ultrasound imaging used to determine the cause of residual limb pain included patients with amputation of an upper of lower limb, but did not mention any vascular findings as a possible cause of pain.[13] O'Reilly et al. found many lesions in the residual limbs, most of them neuromas. With regard to vascular findings, however, only thrombosis and aneurysm formation were found, and only in traumatic amputees.[13]

The four articles on the evaluation of residual limb pain, phantom pain, and back pain focused predominantly on the prevalence of these types of pain and their effects on daily life. They reported a decrease in mobility, ADL, and psychological well-being proportionate to an increase in frequency, duration, and intensity of residual limb pain, phantom pain, and back pain, regardless of the cause of pain.[8,10,14,15]

Gallagher et al. indicated that 50% of lower limb amputees report residual limb pain within the first week after surgery; a percentage that decreases to 13% during a 13-week follow-up.[10] In a different study, 56.1% of patients with a mean duration since amputation of 17 years (standard deviation (SD), 14.6) reported residual limb pain.[10] Ephraim et al.[8] demonstrated a mean pain intensity of 5.1 ± 2.4 on a scale of 1–10, with nearly 50% of the amputees reporting their pain as "somewhat bothersome" and 26.5% as "extremely bothersome." The level of bothersomeness corresponded to the level of depression, and amputees with depressive symptoms were 3.8 (95% confidence interval (CI), 1.8–8.1) times more likely to report their pain as "somewhat bothersome" and 7.2 (95% CI, 3.2–16.1) times more likely to report their pain as "extremely bothersome." None of the studies made a distinction between the different levels of lower limb amputation in relation to the residual limb pain. Contrary to our expectations, traumatic amputees were 1.7 (95% CI, 1.1–2.6) times more likely to report residual limb pain than dysvascular amputees.[8]

One study ranked the interference of residual limb pain with ADL (mean, 2.9; SD, 3.2); recreational, family, and social life (mean, 2.8; SD, 3.1); and ability to work (mean, 3.9; SD, 6.9) on a scale of 1–10.[10]

The paucity of literature on PAOD as a cause of residual limb pain demonstrates the current underestimation of this problem and its consequences for lower limb amputees. The studies we found focused mainly on the prevalence, frequency, duration, and intensity of residual limb pain and phantom limb pain and their influence on daily living. Most studies included both upper and lower limb amputees. Only one article briefly mentioned the difference between residual limb pain and phantom limb pain and their possible coexistence.[8] None of the studies, however, described how to assess the coexistence and interaction between these types of pain and whether there is a possible cause for experiencing both. The number of traumatic amputees included in all studies was higher than the number of dysvascular amputees, and more residual limb pain was reported among traumatic amputees compared with dysvascular amputees. Furthermore, claudication resulting from PAOD was not identified as a possible cause of residual limb pain. Only one case report on claudication in a traumatic lower limb amputee was found, which described a positive effect on the level of pain and ambulation after graft placement to regain peripheral arterial blood flow.

Conclusion

Residual limb pain has a relatively high prevalence in patients with lower limb amputation. Given that dysvascular problems account for most amputations, PAOD is commonly found in amputee patients.[6,16] Therefore, PAOD should be considered when determining the most plausible cause of residual limb pain. Nevertheless, little attention is paid to claudication resulting from PAOD as a possible cause of residual limb pain in the literature, resulting in possibly endless and unnecessary prosthetic fittings and adjustments. It is also important to consider the limitations in activities and participation experienced by the patients due to PAOD. The pain often results in a decrease in mobility, which leads to a higher risk of increase in PAOD. This, in turn, decreases mobility even further, and the patient is caught in a vicious circle. Therefore, it is important to determine the onset and course of residual limb pain to be able to break the vicious circle. We wish to stress the importance of taking PAOD into account as a possible cause of residual limb pain and suggest further research into diagnostics and treatment of PAOD in patients with residual limb pain after lower limb amputation.

Author contribution

All authors contributed equally in the preparation of this manuscript.

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Informed consent

The patient gave consent for the publication of her medical history.

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