

Management of foot problems in patients with rheumatoid arthritis

Summary

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Foot problems are highly prevalent in patients with rheumatoid arthritis (RA). These foot problems often start with pain, swelling and stiffness caused by inflammation of joints and soft tissues. Long-term inflammation can have a destructive impact on the quality and structure of the joints and surrounding soft tissues. This may lead to structural malalignment of the feet due to damage and deformities of foot joints. Malalignment of the feet may result in pain and biomechanical alterations in foot function, i.e. the loading pattern of the foot, resulting in high plantar pressure. In addition to inflammation and biomechanical impairments, dermatological and neurovascular impairments, and external and personal factors can also play a role in RA-related foot problems. These foot problems may lead to restrictions in daily activities and participation, and a reduced quality of life.

Management of foot problems in an early disease stage seems important to reduce pain and activity limitations, and to prevent deterioration of foot function. Also in a more advanced disease stage, treatment of foot problems is often necessary. However, underuse of foot care seems apparent. Among patients there is limited knowledge of the possibilities of, and access to, foot care. Among healthcare providers, there is often limited attention and expertise in the management of RA-related foot problems. Various disciplines can be involved in the management of RA-related foot problems. However, healthcare providers from these different disciplines often lack insight into the specific skills of professionals from another discipline. In order to improve foot care for patients, an overview of the multidisciplinary diagnosis and treatment of foot problems in RA is first necessary. This is needed to provide guidance to healthcare providers and patients in the organisation of timely, appropriate and evidence-based foot care. The objective of the first part of this thesis was to provide an overview of multidisciplinary foot care for patients with rheumatoid arthritis (RA) (Chapter 2-4).

Foot orthoses are frequently used in the treatment of RA-related foot problems. The general aims of prescribing foot orthoses are reducing foot pain and improving physical functioning by influencing biomechanical factors, such as plantar pressure, to an optimum. However, the reported treatment effect of foot orthoses on foot pain in RA is small to medium (effect size 0.40 – 0.45). Efforts to increase the effectiveness of foot orthoses are needed. Plantar pressure measurements can provide a better insight into the loading of the foot during gait. Improving the effects of foot orthoses by using the immediate feedback from in-shoe plantar pressure measurements seems promising. Since high plantar pressures are related to foot pain in RA it is hypothesized that a reduction of forefoot plantar pressure leads to reduction of pain and subsequent disability. Nevertheless, there is a lack of evidence supporting this hypothesis. The objective of the second part of this thesis was to investigate the role of plantar pressure measurements in the management with foot orthoses (Chapter 5-7).



Chapter 1 provides a general introduction of the research topics of this thesis. Insights in the cause and course of RA-related foot problems were described. The factors of influence on these foot problems were depicted in an overview by using the International Classification of Functioning, Disability and Health (ICF) of the World Health Organization. Furthermore, the current management of RA-related foot problems and the role of plantar pressure in the treatment with foot orthoses were addressed. At the end of this chapter, the aim and outline of this thesis was presented.

In Chapter 2 multidisciplinary recommendations for the management of foot problems in patients with RA were developed. The recommendations were based on research evidence and consensus among experts, following published strategies for the development of practice recommendations. The expert group was composed of 2 patients and 22 experienced professionals (rheumatologists, rehabilitation physicians, orthopaedic surgeons, specialized nurses, podiatrists, orthopaedic shoe technicians, pedicurists, and researchers) in the Netherlands. In total, 41 recommendations were developed. Two recommendations concerned a framework for diagnosis and treatment. Thirty-nine recommendations addressed foot care: seven on diagnosis (including check-ups of feet and shoes and diagnostic imaging), 27 on treatment (including corticosteroid injections, foot surgery, therapeutic shoes, foot orthoses, exercise therapy, toe-orthoses and toenail-braces, treatment of toenails and skin), four on communication, and one on organisation of RA-related foot care. These multidisciplinary recommendations can provide guidance in the organisation of timely, appropriate and evidence-based foot care. Implementation of the recommendations, based on a strategy and plan addressing barriers and facilitators for implementation, is needed to improve foot care for the individual patient.

In Chapter 3 the literature was systematically summarized on the effectiveness of therapeutic shoes in patients with RA on the outcomes foot function, foot pain, physical functioning, health-related quality of life, adherence, adverse events and patient satisfaction. Therapeutic shoes include custom-made and ready-made shoes. Custom-made shoes are developed for the individual patient based on specific measures and specifications, whereby a variety of technical adaptations can be incorporated. Ready-made shoes are serial-produced shoes with extra depth, support, incorporated inlays or technical adaptations. Eleven studies were identified, with a total number of 429 participants, of which three were of high quality. Two studies investigated custom-made therapeutic shoes, eight studies ready-made therapeutic shoes, and one study investigated both. For custom-made shoes, a best evidence syntheses showed weak evidence for the reduction of foot pain and improvement of physical functioning. For ready-made shoes, meta-analysis showed a medium to large effect for the reduction of foot pain and a small to medium effect for the improvement of physical functioning. All results were based on within-group differences, since insufficient studies reporting between-group differences were available. The results of this chapter implicate that treatment with therapeutic shoes is effective in patients with RA. However, definitive high-quality RCTs to investigate whether patients with RA benefit more from therapeutic shoes than from non-

therapeutic shoes (i.e. the patient's own shoes or standardized conventional shoes) are needed.

In Chapter 4 the literature was systematically summarized on the comparative effectiveness of foot orthoses in the treatment of various foot problems in patients with rheumatoid arthritis on the primary outcomes foot function and foot pain, and the secondary outcomes physical functioning, health related quality of life, compliance, adverse events, the costs of foot orthoses and patient satisfaction. Ten studies, with a total number of 235 patients, were identified of which three were of high quality. These studies made a comparison between different materials used (soft versus semi-rigid), types of foot orthoses (custom-made versus ready-made; total contact versus non-total contact), or modifications applied (metatarsal bars versus domes). Also, different techniques to construct custom-made foot orthoses were compared (standard custom-moulding techniques versus more sophisticated techniques). Meta-analysis showed a medium effect for (immediate) reduction of forefoot plantar pressure in favour of treatment with soft foot orthoses compared to semi-rigid foot orthoses. Other comparisons between foot orthoses resulted in non-significant effects or inconclusive evidence for one kind of foot orthoses over the other. Based on the results of this chapter, it can be concluded that there is still limited insight into the effectiveness of one kind of foot orthoses compared to another. Therefore, definitive high quality RCTs are needed to investigate the comparative (cost-) effectiveness of different kinds of foot orthoses for the treatment of specific RA-related foot problems.

In Chapter 5 a protocol for optimizing the plantar pressure reduction achieved with foot orthoses treatment by using the feedback of in-shoe plantar pressure measurements was evaluated. Forty-five RA patients with foot problems were included in this observational proof-of concept study. Custom-made foot orthoses were made by a podiatrist according to usual care. In 43 patients usual care foot orthoses were evaluated using in-shoe plantar pressure measurements and, if necessary, adapted. Adapted foot orthoses were developed in 70% of the patients. In these patients, usual care foot orthoses showed a mean 9% reduction in forefoot plantar pressure compared to no-foot orthoses. Foot orthoses adaptation led to an additional mean 3% plantar pressure reduction. Semi-structured interviews were held with patients and podiatrists to evaluate the feasibility of the protocol. The protocol was considered feasible by patients. Podiatrists considered the protocol more useful to achieve individual rather than general treatment goals. A final foot orthoses optimization protocol has been proposed in which individual treatment goals are set aimed at redistribution of plantar pressure in painful foot regions. The results of this chapter may have several implications for both clinical practice and podiatry education. First, in-shoe plantar pressure measurements can be used as an additional diagnostic tool in RA patients with foot problems; it provides insight in the relation between foot pain and plantar pressure during walking with shoes. Second, the immediate feedback of in-shoe plantar pressure measurements may offer guidance to the process of evaluation and adaptation of foot orthoses.



In Chapter 6 the developed foot orthoses according to the ‘foot orthoses optimization protocol’ (as described in Chapter 5) were evaluated on pain, physical functioning and plantar pressure of the forefoot after three months of wearing foot orthoses in 38 patients. The within-group change scores showed a medium effect on pain reduction, a large effect on improvement of physical functioning and a small effect on forefoot plantar pressure reduction. Whether foot orthoses developed according to the ‘foot orthoses optimization protocol’ may lead to better clinical outcomes compared to foot orthoses developed without this protocol is unclear. Further investigation on the clinical relevance of using the protocol is required. Furthermore, the relationship between change in forefoot plantar pressure and change in pain and physical functioning was determined in a subgroup of 23 patients. In these patients no statistically significant relations were found between change in plantar pressure and change in pain or physical functioning. Therefore, the hypothesis that more pressure reduction would lead to better clinical outcomes could not be proven.

In Chapter 7 the association of plantar pressure with disease activity and deformity in the forefoot was investigated in a cross sectional study, using data of 172 RA patients with forefoot problems from the Amsterdam Foot (AMS-foot) cohort. Plantar pressure in the forefoot was measured with a pressure platform. Forefoot deformity was assessed using the Platto score. Forefoot disease activity was defined as swelling and/or pain assessed by palpation of the metatarsophalangeal joints. Higher plantar pressures were found in forefoot regions with deformities compared to forefoot regions without forefoot pathology. This confirms our hypothesis and findings of previous research that forefoot deformities are related to higher plantar pressures. No association between local disease activity and lower plantar pressure could be confirmed. Future research with sensitive imaging measures to detect disease activity is recommended to reveal the effect of forefoot disease activity on plantar pressure.

Finally, in Chapter 8 the main results of this thesis are summarized and discussed and directions for future research are provided.