

## Special Article

# Proposed treatment algorithm for hallux rigidus

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## Abstract

This study performs a literature review on the treatment of hallux rigidus and proposes a treatment algorithm.

This literature systematic review expanded a similar study conducted in 2014 by the authors and analyzed the levels of recommendation according to scientific evidence.

Most articles found in the search present scarce evidence (level IV or case series), we only found 8 articles with an at least moderate level of recommendation (B); of these, only one article had a level of evidence I.

Conservative treatment is effective with the implementation of footwear modifications, use of insoles, and infiltrations with hyaluronic acid. Cheilectomy, either isolated or combined with Moberg osteotomy, shows good outcomes in stage III, or moderate, although its outcomes worsen after 5 years. Metatarsophalangeal joint (MTPJ) arthrodesis is still the gold standard in stage IV, or advanced. In recent years, the technique of interposition arthroplasty has re-emerged, especially with the use of a synthetic cartilage implant (Cartiva®), with outcomes at least similar to those of MTPJ arthrodesis in comparative studies.

**Level of Evidence III; Therapeutic Studies; Systematic Review of Level III Studies.**

**Keywords:** Hallux rigidus; Conservative treatment; Algorithms.

## Introduction

Therapeutic algorithms based on scientific evidence are desirable both in Orthopedic Surgery and in other medical fields. They may be helpful in the sequential treatment of patients, according to the stage of their disease.

Hallux rigidus, or arthrosis of the first metatarsophalangeal joint (MTPJ), is the most frequent arthrosis of the foot, affects 2.5% of the population older than 50 years<sup>(1)</sup>, and has 4 evolutionary stages described (mild-moderate: I and II; moderate-severe: III and IV). This article aims to present a global algorithm for the treatment of this disease, both conservative and surgical, following the principles of a similar study published in 2014, adding new evidence from the last 7 years<sup>(2)</sup>.

A search was conducted on the main databases, including PubMed and PEDro. The search period used in a similar article published in 2014 was expanded to present times<sup>(2)</sup>. Inclusion criteria were as follows: randomized clinical trials, prospective studies, systematic reviews, or meta-analysis that studied conservative or surgical treatments of hallux rigidus and that

described their level of scientific evidence. For those studies that did not provide information on scientific evidence, we used the Jadad scale<sup>(3)</sup>.

Search criteria for conservative treatment: Hallux rigidus and “conservative treatment”, “nonoperative treatment”, “manual therapy”, “chiropractic therapy”, “physical therapy”, “injection”.

- Search criteria for surgical treatment: Hallux rigidus and (arthrodesis or arthroplasty or osteotomy or cheilectomy or osteophyctectomy or exostectomy or surgery).
- Exclusion criteria: articles not in English or Spanish, clinical cases, surgical techniques, experimental techniques, biomechanical studies, studies in cadavers or in artificial bones, articles that did not report their results, articles whose level of evidence could not be obtained.
- Final selection criteria: treatments with a grade of recommendation A or B and/or a Jadad score higher than 3 were considered as recommendable.

Study performed at the Orthopaedic Department, University Hospital of Canary Islands, La Laguna, Tenerife, Spain.

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## Results

With regard to conservative treatment, we found only three articles with a grade of recommendation of at least B: Pons et al.<sup>(4)</sup> showed the superiority of injections of hyaluronate compared to corticosteroids. Zammit et al.<sup>(5)</sup> confirm the effectiveness of custom orthosis and footwear modifications. Finally, Menz et al.<sup>(6)</sup> studied the predictors of response to custom orthoses and rocker-sole footwear in patients with hallux rigidus, but they were not able to identify any specific individual factor (Figure 1).

In relation to surgical treatment, we found 5 articles with grade of recommendation A or B<sup>(7-11)</sup>: Roukis and Townley<sup>(7)</sup> published an article with level II evidence comparing BIOPRO resurfacing endoprosthesis versus Youngswick or Watermann-type osteotomy of the primer metatarsal and did not find significant differences, showing a high percentage of satisfaction in both groups. Kilmartin<sup>(8)</sup> performed a study with moderate grade of recommendation, ie, B, comparing phalangeal versus metatarsal osteotomy and concluded that none of them can be definitely recommended for the treatment of hallux rigidus. A prospective study with level II evidence conducted by Gibson and Thomson<sup>(9)</sup> stated that MTPJ arthrodesis is more effective than total joint arthroplasty. In 2016, Baumhauer et al.<sup>(10)</sup> conducted the only prospective, randomized, controlled trial (level I) that compared MTPJ arthrodesis versus interposition arthroplasty with synthetic cartilage implant (Cartiva®), showing equivalent pain relief and functional outcomes. Finally, Glazebrook et al.<sup>(11)</sup> attest the efficacy and safety of synthetic cartilage implant (Car-

tiva®), demonstrating satisfactory outcomes at 5.8 years in a prospective article with 112 patients.

Innovations in the treatment of hallux rigidus in the last 5 years are related to the implementation of joint preservation techniques in moderate and even advanced stages, which may achieve at least the same functional outcome than arthrodesis<sup>(1,5,10,11)</sup>. If we obviate this treatment, cheilectomy as a treatment that preserves mobility in stages of moderate compromise and metatarsophalangeal arthrodesis in advanced stages are still the treatments with the greater scientific evidence and confirmed efficacy in mid- and long-term studies<sup>(1,5,12-14)</sup>. Conversely, the literature sustains that conservative treatment is efficient in at least 50% of patients and thus should always be the first treatment of choice, regardless of the evolutionary course of the disease<sup>(1)</sup>.

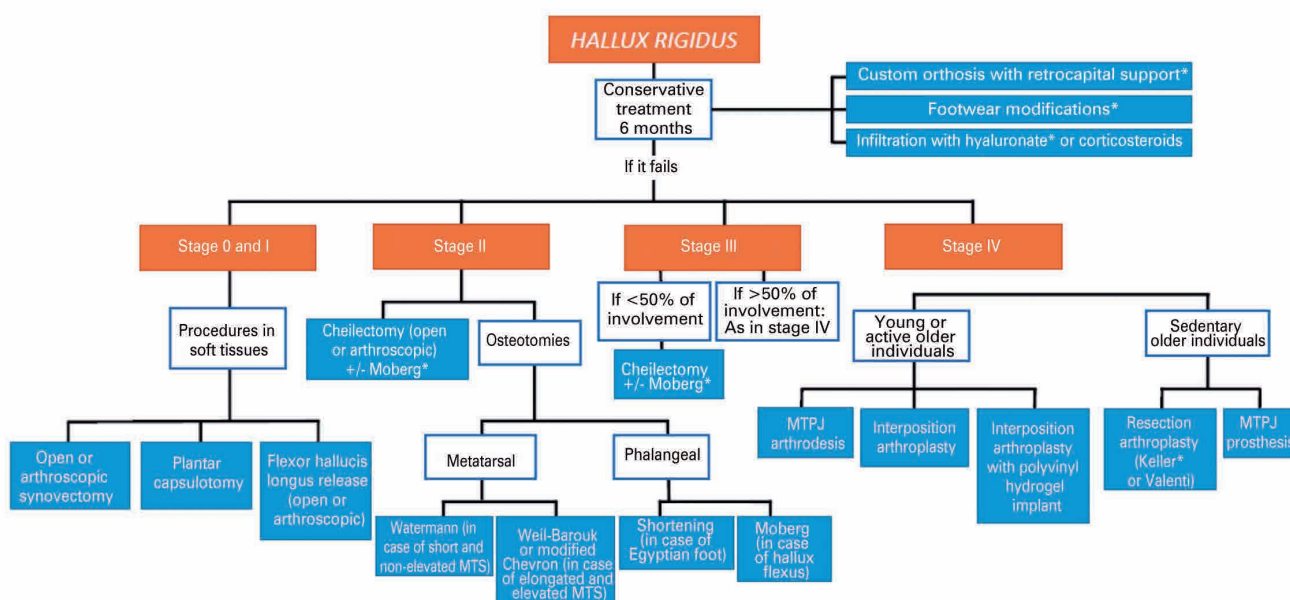
## Conclusions

Conservative treatment is effective in 50% of patients (footwear modifications, plantar orthosis, and infiltrations with hyaluronic acid),

Cheilectomy, either isolated or in combination with Moberg osteotomy, shows good outcomes in moderate stages (II and selected III), although its outcomes worsen after 5 years.


MTPJ arthrodesis is still the gold standard in advanced stage (IV).

In recent years, the technique of interposition arthroplasty has re-emerged, especially with the use of a synthetic cartilage implant as a mobile alternative in patients who reject MTPJ arthrodesis.



MTS: Metatarsal. MTPJ: Metatarsophalangeal joint.  
\*Techniques with grades of recommendation A or B, or Jadad score > 3.

Figure 1. Global treatment algorithm of hallux rigidus.

**Authors' contributions:** Each author contributed individually and significantly to the development of this article: MHP\* (<https://orcid.org/0000-0001-6188-5269>) Conceived and planned the activities that led to the study, wrote the paper, approved the final version; DGM\* (<https://orcid.org/0000-0002-4891-515X>) Participated in the review process and approved the final version; RVP\* (<https://orcid.org/0000-0002-8254-2916>) Participated in the review process and approved the final version. All authors read and approved the final manuscript. \*ORCID (Open Researcher and Contributor ID) .

## References

1. Ho B, Baumhauer J. Hallux rigidus. *EFORT Open Rev* 2017;2(1):13-20.
2. Herrera-Pérez M, Andarcia-Bañuelos C, de Bergua-Domingo J, Paul J, Barg A, Valderrabano V. [Proposed global treatment algorithm for hallux rigidus according to evidence-based medicine]. *Rev Esp Cir Ortop Traumatol*. 2014;58(6):377-86.
3. Jadad AR, Moore RA, Carroll D, Jenkinson C, Reynolds DJ, Gavaghan DJ, et al. Assessing the quality of reports of randomized clinical trials: is blinding necessary? *Control Clin Trials*. 1996;17(1):1-12.
4. Pons M, Alvarez F, Solana J, Viladot R, Varela L. Sodium hyaluronate in the treatment of hallux rigidus. A single-blind, randomized study. *Foot Ankle Int*. 2007;28(1):38-42.
5. Zammit GV, Menz HB, Munteanu SE, Landorf KB, Gilheany MF. Interventions for treating osteoarthritis of the big toe joint. *Cochrane Database Syst Rev*. 2010;(9):CD007809.
6. Menz HB, Auhl M, Tan JM, Levinger P, Roddy E, Munteanu SE. Predictors of response to prefabricated foot orthoses or rocker-sole footwear in individuals with first metatarsophalangeal joint osteoarthritis. *BMC Musculoskelet Disord*. 2017;18(1):185.
7. Roukis TS, Townley CO. BIOPRO resurfacing endoprosthesis versus periarticular osteotomy for hallux rigidus: short-term follow-up and analysis. *J Foot Ankle Surg*. 2003;42(6):350-8.
8. Kilmartin TE. Phalangeal osteotomy versus first metatarsal decompression osteotomy for the surgical treatment of hallux rigidus: a prospective study of age-matched and condition-matched patients. *J Foot Ankle Surg*. 2005;44(1):2-12.
9. Gibson JN, Thomson CE. Arthrodesis or total replacement arthroplasty for hallux rigidus: a randomized controlled trial. *Foot Ankle Int*. 2005;26(9):680-90.
10. Baumhauer JF, Singh D, Glazebrook M, Blundell C, De Vries G, Le IL, et al. Prospective, Randomized, Multi-centered Clinical Trial Assessing Safety and Efficacy of a Synthetic Cartilage Implant Versus First Metatarsophalangeal Arthrodesis in Advanced Hallux Rigidus. *Foot Ankle Int*. 2016;37(5):457-69.
11. Glazebrook M, Blundell CM, O'Dowd D, Singh D, de Vries G, Le IL, et al. Midterm outcomes of a synthetic cartilage implant for the first metatarsophalangeal joint in advanced hallux rigidus. *Foot Ankle Int*. 2019;40(4):374-83.
12. Lam A, Chan JJ, Surace MF, Vulcano E. Hallux rigidus: How do I approach it? *World J Orthop*. 2017;8(5):364-71.
13. Cöster MC, Cöster ME, Montgomery F. Hallux rigidus - Osteoarthritis of the first MTP-joint. Surgical and patient-reported results from Swefoot. *Foot Ankle Surg*. 2021;27(5):555-8.
14. Hoveidaei AH, Roshanshad A, Vosoughi AR. Clinical and radiological outcomes after arthrodesis of the first metatarsophalangeal joint. *Int Orthop*. 2021;45(3):711-9.