

Metatarsophalangeal arthroscopy of the hallux: a description of a modified technique

Artroscopia metatarsofalângica do hálux: descrição de técnica modificada

Maria Augusta Back Nascimento¹, Anna Carolina Coelho Nogueira², Carlos Daniel Cândido de Castro Filho¹, André Vitor Kerber Cavalcante Lemos³, Mário Sérgio Paulillo de Cillo¹, Cíntia Kelly Bittar^{1,4}

1. Pontifícia Universidade Católica de Campinas, Campinas, SP, Brazil.
2. Hospital Geral de Carapicuíba, Carapicuíba, SP, Brazil.
3. Universidade Federal de São Paulo, São Paulo, SP, Brazil.
4. Instituto Wilson Mello, Campinas, SP, Brazil.

ABSTRACT

Objective: This study sought to describe a modified arthroscopic technique in which a traction device with a horizontal vector and nylon mesh are used to allow continuous and uniform distraction without requiring an assistant surgeon to perform manual traction.

Methods: Nine patients (seven females and two males; mean age 31.8 [30-52] years) with an indication for treatment of this joint who had been diagnosed with different pathologies, including synovitis, hallux vagus, and hallux rigidus, were selected and underwent arthroscopy of the first metatarsophalangeal joint using this modified technique.

Results: Patient evaluations determined using the American Orthopedic Foot and Ankle Society (AOFAS) Ankle-Hindfoot Scale were recorded before and after surgery. The mean scores before and after the procedure were 43.66 (32-55) and 95.22 (90-98), respectively. No scars or joint complications were observed at a six-month follow-up, and all subjects experienced rapid recovery and quickly returned to daily functions.

Conclusion: Similarly to conventional arthroscopy of the metatarsophalangeal joint, the modified technique produced satisfactory surgical outcomes; moreover, this technique reduced surgical time and improved the surgeon's autonomy by obviating the need for an assistant surgeon to perform traction.

Level of Evidence IV; Therapeutic Studies; Case Series.

Keywords: Metatarsophalangeal joint/surgery; Hallux Rigidus/surgery; Arthroscopy/methods; Cartilage diseases.

RESUMO

Objetivo: Descrever a técnica artroscópica modificada, com auxílio de dispositivo tracionador com vetor horizontal e malha chinesa, visando distração contínua e uniforme, sem necessidade do auxílio de tração manual realizada por um cirurgião assistente.

Métodos: Foram selecionados nove pacientes com indicação de tratamento desta articulação, diagnosticados com patologias como: sinovite, lesão condral e halux rígido, sendo sete mulheres e dois homens, com idade média de 31,8 anos (30-52), submetidos à artroscopia da primeira articulação metatarsofalângica, realizadas pela técnica modificada.

Resultados: A avaliação dos pacientes foi registrada através do questionário AOFAS pré e pós-cirúrgico, que apresentou média de 43,66 (32-55) pontos antes e 95,22 (90-98) pontos após o procedimento. Não foram observadas complicações no *follow-up* de seis meses relacionados a problemas cicatriciais ou articulares; todos os sujeitos relataram rápida recuperação e breve retorno às funções diárias.

Conclusão: Assim como a artroscopia convencional da articulação metatarsofalângica, os resultados com a técnica modificada foram satisfatórios, apresentaram tempo cirúrgico reduzido e maior autonomia ao cirurgião por não necessitar do auxílio de um assistente para realizar a tração.

Nível de Evidência IV; Estudos Terapêuticos; Série de Casos.

Descritores: Articulação metatarsofalângica/cirurgia; Hallux Rígido/cirurgia; Artroscopia/métodos; Doenças das cartilagens.

Work performed at the Pontifícia Universidade Católica de Campinas, Campinas, SP, Brazil.

Correspondence: Maria Augusta Back Nascimento. Av. John Boyd Dunlop, S/N - Jardim Londres, Campinas, SP, Brasil, CEP: 13034-685
E-mail: mabn88@hotmail.com

Conflicts of interest: none. **Source of funding:** none.

Date received: December 30, 2018. **Date accepted:** March 20, 2019. **Online:** May 03, 2019.



How to cite this article: Bittar CK, Cillo MSP, Castro Filho CDC, Nascimento MAB, Lemos AVK, Nogueira ACC. Metatarsophalangeal arthroscopy of the hallux: a description of a modified technique. *Sci J Foot Ankle.* 2019;13(2):119-23.

INTRODUCTION

In orthopedic surgery, with new technologies and improvements in surgical materials, arthroscopy has become a good option as a less invasive treatment with faster postoperative recovery. Advances in ankle arthroscopy have led to the development of smaller materials that can be used to endoscopically and non-invasively operate on the metatarsophalangeal joint of the hallux^(1,2).

The main indications for this procedure are degenerative joint disease, osteochondral lesions, intra-articular loose bodies, arthrofibrosis, synovitis, and hallux rigidus, among others; the objectives of such treatment are to provide satisfactory relief of patient symptoms and a faster return to daily activities. In certain cases, arthroscopic treatment with a minimally invasive procedure can avoid or postpone the need for more invasive reconstructive procedures.

However, arthroscopic surgery of the first metatarsophalangeal joint of the hallux is complex and requires an anatomical and spatial understanding of the region as well as mastery of the arthroscopic technique and use of its basic principles of distraction, distension, and video imaging⁽³⁾. Such surgery can be performed under general anesthesia, spinal anesthesia, or regional anesthetic block.

The use of the aforementioned techniques to manage complications in the first metatarsophalangeal joint has increased in popularity in recent years and has allowed for a decrease in open procedures. Many surgeons prefer arthroscopic techniques because of these techniques' advantages of better visualizing joint structures, reducing scars, and promoting faster recovery, leading to a faster return to daily functions.

The objective of this study was to describe a modified arthroscopic technique involving the use of a traction device with a horizontal vector and nylon mesh to ensure continuous and uniform distraction and clinically evaluate patients who were operated on using this technique.

METHODS

This study was approved by the Research Ethics Committee with registration in the Brazil Platform under CAAE number: 00229218.1.0000.5599 and fulfilled all ethics requirements for human research. Nine consecutive patients

(seven women and two men; 31 to 63 years of age) diagnosed with different pathologies, including osteochondritis dissecans, hallux rigidus, and ulnar impaction syndrome, were subjected to arthroscopy of the first metatarsophalangeal joint using a modified technique. Before surgery, all patients had received six months of conservative therapy that was unsuccessful and were then selected for surgical treatment. These patients were evaluated using the American Orthopedic Foot and Ankle Society (AOFAS) Ankle-Hindfoot Scale before surgery and six months after surgery.

Surgical procedure

In accordance with studies by Ferkel⁽⁴⁾ and other authors^(5,6), a conventional surgical arthroscopic technique involving the use of a pneumatic power system was adopted; the patient was in a supine position with the relevant heel on the distal area of the surgical table and was under sedation and ankle-foot peripheral nerve block⁽⁷⁾ or spinal anesthesia.

The technique was modified to improve the agility and independence of the surgeon during the procedure. The modifications consisted of coupling a hand-held distractor to the operating table with a fixation system and then covering the operated area with sterile drapes.

The surgical procedure was initiated by inserting a 2.7-mm trocar and an arthroscope of the same size through the anteromedial portal and the anterolateral portal, respectively. Tweezers, a shaver, and other instruments were also used.

To perform joint distraction effectively, the equipment attached to the surgical table should bear 8-10% of the patient's body weight. A nylon mesh was wrapped around the distal phalanx of the hallux and attached to the wrist distractor, allowing for better visualization of the metatarsal head and the base of the proximal phalanx (Figure 1).

RESULTS

An intraoperative complication was reported in one case involving a patient who was more than 1.90 m in height and approximately 200 kg. In this case, the available nylon mesh had a smaller diameter than the patient's distal pha-



Figure 1. Device and patient positioning during arthroscopy.
Source: Authors' personal archive.

lanx, and sterile gauze bandages were used instead of this mesh to support the limb. There were no other complications during or after surgery.

Osteophytes were removed, and the patients underwent synovectomy. Increases in the range of dorsiflexion of the hallux were evaluated intraoperatively.

The AOFAS questionnaire scores ranged from 32 to 55 (mean, 43.6; median, 45; standard deviation, 6.3) before arthroscopy and from 90 to 98 (mean, 95.2; median, 96; standard deviation, 2.9) six months after arthroscopy (Table 1).

The most commonly reported observations during two years of follow-up were complete disappearance of or significant improvement in pain and a rapid return to daily activities.

DISCUSSION

Arthroscopic techniques for the first metatarsophalangeal joint of the hallux are well known and widely performed⁽⁸⁻¹¹⁾. However, relative to previously reported approaches, the technique proposed in this study produces better outcomes, requires less surgical time, is associated with fewer complications, and provides greater autonomy to the surgeon, consequently allowing for earlier rehabilitation and higher patient satisfaction⁽¹²⁾, as evidenced by the reported AOFAS scores. In addition, scars were smaller,

Table 1. Preoperative and postoperative results determined using the American Orthopedic Foot and Ankle Society (AOFAS) Ankle-Hindfoot Scale.

Patient	Gender, age	Profession	Surgery	Side	AOFAS score before surgery	AOFAS score six months after surgery
R.I.	Female, 39	Ballet dancer	Joint arthroscopy for hallux valgus	Left	32	97
K.A.S.	Female, 46	Psychologist	Joint arthroscopy for hallux valgus	Right	45	98
F.C.J.S.	Female, 35	Teacher	Arthroscopy for synovitis of the first metatarsophalangeal joint	Right	42	95
L.M.	Male, 38	Personal trainer	Arthroscopy for synovitis of the first metatarsophalangeal joint	Left	36	90
S.R.M.M.	Female, 52	Personal trainer	Arthroscopic cheilectomy for hallux rigidus	Right	47	95
R.S.S.L.	Female, 41	Personal trainer	Arthroscopic cheilectomy for hallux rigidus	Right	55	98
A.M.C.T.	Female, 42	Business administrator	Joint arthroscopy for hallux valgus	Right	52	91
G.B.F.	Male, 33	Accountant	Arthroscopy for synovitis of the first metatarsophalangeal joint	Left	45	96
A.C.C.	Female, 36	HR analyst	Joint arthroscopy for hallux rigidus	Left	39	97
AOFAS score before surgery						
Mean	43.66					
Median	45					
Standard deviation	6.33					
AOFAS score after surgery						
Mean	95.22					
Median	96					
Standard deviation	2.92					

Source: Prepared by the author based on the results of the research.

reducing the risk of local fibrosis, which affects quality of life, particularly for athletes, and improving post-surgical aesthetics⁽¹³⁾.

Osteophyte removal and arthroscopic joint debridement depend on good visualization of joint surfaces because the anteromedial and anterolateral portals are not sufficient; in the current study, in contrast to the findings reported by Nakajima et al.⁽¹⁾, non-invasive distraction of the first metatarsophalangeal joint of the hallux was necessary.

Regardless of whether a patient suffers from osteochondritis dissecans, ulnar impaction syndrome, or hallux rigidus, the joint's range of motion and dorsiflexion are limited or blocked because of the presence of spurs and osteophytes as a consequence of recurrent microtraumas due to the wearing of high-heeled shoes or the practicing of sports activities.

With advances in minimally invasive surgical techniques, metatarsophalangeal joint arthroscopy of the hallux^(7,14,15) has been combined with percutaneous cheilectomy in cases of hallux rigidus, and the latter procedure can be performed with a bone scraper using the technique proposed in this study, with small skin incisions and resolution of the pathology. This procedure was not performed in the current investigation because the necessary materials were not available. Instead, arthroscopy combined with minimally invasive surgical drilling was used to achieve the

same outcomes, suggesting that the described technique can be employed in accordance with the purposes and requirements of each surgery, further individualizing treatment and results, with preoperative planning, knowledge of the patient's profile and needs, and available materials considered to reduce the risk of complications.

In conclusion, the observed outcomes were as satisfactory as those achieved using a conventional arthroscopic technique for the first metatarsophalangeal joint of the hallux, and the modified technique has the advantages of obviating the need for an auxiliary surgeon during surgery, permitting better visualization of joint surfaces, and providing greater autonomy to the surgeon.

However, this study has certain limitations, including its small sample size, its case-series design, and the absence of a control group.

CONCLUSION

The results obtained with the modified technique were extremely satisfactory; the use of this technique decreased surgical time, provided greater autonomy to the surgeon, who did not require help from an assistant surgeon to perform joint traction, and permitted non-invasive traction. During follow-up, all patients achieved rapid recovery and quickly returned to sports activities with optimal daily functioning.

Authors' contributions: Each author contributed individually and significantly to the development of this article: CKB ^{*}(<https://orcid.org/0000-0002-1997-5372>) conceived and planned the activities that led to the study, wrote the article, participated in the review process, approved the final version; MSPC ^{*}(<https://orcid.org/0000-0002-0758-2547>) interpretou resultados do estudo, participou do processo de revisão; CDCC ^{*}(<https://orcid.org/0000-0003-3522-1076>) conceived and planned the activities that led to the study, wrote the article, participated in the review process, approved the final version; MABN ^{*}(<https://orcid.org/0000-0003-0112-8295>) interpretou resultados do estudo, participou do processo de revisão, aprovou a versão final; AVKC ^{*}(<https://orcid.org/0000-0001-8974-5815>) participated in the review process, approved the final version; ACCN ^{*}(<https://orcid.org/0000-0002-2073-0225>) participated in the review process, approved the final version. ^{*}ORCID (Open Researcher and Contributor ID).

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