RBO REVISTA BRASILEIRA DE ORTOPEDIA
www.rbo.org.br

Original Article

Use of the semitendinosus tendon for foot and ankle tendon reconstructions☆,☆☆

Frederico Lutti Guerra de Aguiar Zink[a,*], *Danilo Glória Mendonça*[a], *Cintia Kelly Bittar*[a], *José Luís Amim Zabeu*[a], *Osny Salomão*[b], *Antonio Egydio de Carvalho Junior*[c], *Marcelo Tarso Torquato*[d], *Décio Cerqueira de Moraes Filho*[e]

[a] *Serviço de Ortopedia e Traumatologia, Pontifícia Universidade Católica de Campinas (PUC-Campinas), Campinas, SP, Brazil*
[b] *Departamento de Ortopedia e Traumatologia, Universidade de São Paulo (USP), São Paulo, SP, Brazil*
[c] *Departamento de Ortopedia e Traumatologia, Universidade Estadual de Campinas (UNICAMP), Campinas, SP, Brazil*
[d] *Serviço de Ortopedia e Traumatologia, Hospital de Base de Bauru, Bauru, SP, Brazil*
[e] *Serviço de Ortopedia e Traumatologia, Faculdade de Medicina de Marília (FAMEMA), Marília, SP, Brazil*

ARTICLE INFO

Article history:
Received 8 August 2013
Accepted 16 September 2013
Available online 13 August 2014

Keywords:
Achilles tendon/injuries
Achilles tendon/surgery
Tendons
Foot
Ankle
Reconstruction

ABSTRACT

Objective: To demonstrate the results obtained from foot and ankle tendon reconstructions using the tendon of the semitendinosus muscle. The clinical results, the patient's degree of satisfaction and complications in the graft donor and recipient areas were evaluated.
Methods: This was a retrospective study in which the medical files of 38 patients who underwent this surgical procedure between 2006 and 2010 were surveyed. The functional results from this technique, the complications in the donor and recipient areas and the patients' degree of satisfaction were evaluated.
Results: Three patients presented complications in the recipient area (skin necrosis); one patient showed complications in the donor area (pain and insensitivity); and all patients had satisfactory functional results, with complete range of motion.
Conclusion: The semitendinosus muscle is a good option for treatments for foot and ankle tendon injuries.

Uso do tendão semitendíneo em reconstruções tendíneas do pé e do tornozelo

Palavras-chave:
Tendão de Aquiles/lesões

RESUMO

Objetivo: Demonstrar os resultados obtidos nas reconstruções tendíneas do pé e do tornozelo com o uso do tendão do músculo semitendíneo. Foram avaliados os resultados clínicos,

☆ Work developed at the Celso Pierro Hospital and Maternity Hospital, Pontifical Catholic University, Campinas, SP, Brazil.
☆☆ Please cite this article as: Zink FLGDA, DG Mendonça DG, Bittar CK, Zabeu JLA, Salomão O, de Carvalho Junior AE, et al. Uso do tendão semitendíneo em reconstruções tendíneas do pé e do tornozelo. Rev Bras Ortop. 2014;49(5):528-31.

* *Corresponding author.*
E-mail: fredericozink@hotmail.com (F. Lutti Guerra de Aguiar Zink).

http://dx.doi.org/10.1016/j.rboe.2013.09.001

Tendão de Aquiles/cirurgia
Tendões
Pé
Tornozelo
Reconstrução

o grau de satisfação do paciente e as complicações da área doadora e receptora do enxerto.
Métodos: Estudo retrospectivo em que foram levantados os prontuários de 38 pacientes submetidos a esse procedimento cirúrgico entre 2006 e 2010 e avaliados os resultados funcionais dessa técnica, as complicações das áreas doadora e receptora e o grau de satisfação dos pacientes.
Resultados: Três apresentaram complicações da área receptora (necrose de pele), um complicação da área doadora (dor e insensibilidade) e todos tiveram resultados funcionais satisfatórios com arco de movimento completo.
Conclusão: O músculo semitendinoso é uma boa opção de tratamento para lesões tendinosas do pé e tornozelo.

Introduction

Use of the tendon of the semitendinosus muscle in knee ligament reconstruction surgery is well established in the literature.[1] It is now also used as a treatment option for surgical reconstruction of foot and ankle tendons.[2,3]

Foot and ankle tendon tears occur most frequently between the third and fifth decades of life, although they can occur at any age, with clear predominance of cases among men. It is believed that the frequency of these injuries is higher nowadays because of better physical conditioning and increased sports practice among middle-aged and elderly individuals. The etiology and treatment of these injuries continues to be a matter of controversy in the orthopedic literature. Currently, there is no preferential treatment method.

Among the options for surgical treatment, methods involving primary suturing and reconstructions using the following tendons have been cited: short fibular muscle,[4,5] long fibular muscle,[6] gracilis muscle, long flexor muscle of the hallux[7] and semitendinosus muscle.[2,3]

The aim of the present study was to evaluate the functional results obtained from treating patients who underwent tendon reconstruction surgery with a graft from the tendon of the semitendinosus muscle, emphasizing the incidence of complications in the graft donor and recipient areas and the patients' degree of satisfaction.

Materials and methods

Thirty-eight patients with a diagnosis of acute or degenerative foot or ankle tendon tears between 2006 and 2010 were selected. Age, sex, tendon affected, type of injury and complications were analyzed. Patients with diabetes mellitus and vascular diseases were excluded. The mean length of follow-up was two years.

This study used the questionnaire of the American Orthopaedic Foot and Ankle Society (AOFAS), which analyzes data on pain, limitation of activities, need for support, walking distance and walking abnormalities, sagittal mobility, hindfoot mobility, ankle stability, hindfoot stability and hindfoot alignment.

Results

Among the 38 patients selected, 27 presented injuries of the calcaneal tendon and nine presented injuries of the anterior tibial tendon. In two cases, these injuries were associated with the long extensor of the toes; in one case, with the long extensor of the hallux; and in one case, with both the long extensor of the toes and the long extensor of the hallux. One patient presented injury to the fibular tendons (short and long) and one, injury to the tendon of the long extensor of the toes.

Three patients who underwent reconstruction of the calcaneal tendon presented complications of the receptor area (7.8%): superficial skin necrosis, deep necrosis and dehiscence of the scar. Only one patient presented complications of the donor area (2.6%), which were reported as pain and insensitivity. The reconstructions of the other tendons did not present complications.

The clinical–functional results obtained through the AOFAS scale after the operation were similar to those found in the literature, with a mean of 90 points (variation from 81 to 92).[8–10]

The mean length of follow-up was two years.

By the end of the study period, all of the patients had resumed their recreational and professional activities with complete ranges of motion, except for two cases that evolved unsatisfactorily (5%) (Table 1).

Discussion

The predominant age group in the present study was concordant with data in the literature. There were 28 patients aged between 30 and 50 years[11] and trauma was the main cause of the injuries. The tendon most affected was the calcaneal tendon (71%).

Several options for tendon reconstructions in the foot and ankle exist.[2,4,6] Use of the tendon of the semitendinosus muscle theoretically offers the following advantages: it is more resistant than those previously used for transfers; it avoids compromising of the tibial vascular-nervous bundle or muscles of the lateral compartment; and lastly, transferring the tendon of the semitendinosus muscle maintains the normal muscle balance of the ankle. If the tendon of the short fibular muscle is used for reconstruction of the calcaneal tendon,[4,5]

Table 1 – General data on the patients who underwent tendon reconstruction.

Patients	Age	Sex	Tendon affected	RAC	DAC	DS	Type of injury
1	47	M	CT	No	No	S	Trauma
2	35	M	CT	No	No	S	Trauma
3	65	M	CT	No	No	S	Degenerative
4	62	F	CT	No	No	S	Trauma
5	47	F	CT	No	No	S	Trauma
6	41	M	CT	No	No	S	Trauma
7	39	M	CT	No	No	S	Degenerative
8	38	M	CT	Yes	No	S	Trauma
9	34	M	CT	Yes	No	D	Trauma
10	15	M	AT	No	No	S	Trauma
11	42	M	AT	No	No	S	Trauma
12	67	M	AT	No	No	S	Degenerative
13	61	M	AT	No	No	S	Degenerative
14	26	M	LET	No	No	S	Trauma
15	28	M	AT + LET	No	No	S	Trauma
16	26	M	AT + LET + LEH	No	No	S	Trauma
17	47	M	AT	No	No	S	Trauma
18	37	M	AT + LET	No	No	S	Trauma
19	19	M	AT + LEH	No	No	S	Trauma
20	52	M	CT	No	No	S	Trauma
21	23	M	CT	No	No	S	Trauma
22	59	M	CT	No	No	S	Degenerative
23	36	M	CT	No	No	S	Trauma
24	31	M	CT	No	No	S	Trauma
25	59	M	FC + FL	No	No	S	Degenerative
26	34	M	CT	No	No	S	Trauma
27	48	M	CT	No	No	S	Degenerative
28	48	M	CT	No	Yes	S	Trauma
29	36	M	CT	Yes	No	D	Degenerative
30	46	M	CT	No	No	S	Trauma
31	39	M	CT	No	No	S	Degenerative
32	39	M	CT	No	No	S	Trauma
33	53	M	CT	No	Yes	S	Trauma
34	53	M	CT	No	No	S	Degenerative
35	41	M	CT	No	Yes	S	Trauma
36	41	M	CT	No	No	S	Trauma
37	46	M	CT	No	No	S	Trauma
38	37	M	CT	No	No	S	Trauma

CT, calcaneal tendon; AT, anterior tibial tendon; LET, long extensor of the toes; LEH, long extensor of the hallux; FL, fibular; RAC, receptor area complication; DAC, donor area complication; DS, degree of satisfaction; S, satisfied; D, dissatisfied.

for example, an evertor is used to perform plantar flexion. This type of transfer is less functional, according to the tendon transfer rules, and partial loss of eversion force can be observed.

It should be noted that Mafulli et al.,[2,3] used transfers of the tendon of the semitendinosus muscle to repair injuries of the calcaneal tendon with a distance between the stumps of greater than 6 cm and obtained good results.

In our study, the percentage of complications (10.5%) was less than what was described by Krueger-Frank et al. Although the latter authors achieved good results from tendon reconstructions, they had a higher complication rate (15.1%).[12]

The importance of the tendon of the semitendinosus muscle for walking, running or jumping is well known. Nonetheless, its use in knee ligament reconstruction is well established and no functional losses in its absence are observed.[1]

Most of the patients presented excellent results and even those with results that were considered good were able to return to their activities without restrictions. The latter were thus classified only because of complications relating to the operative wound. No repetitions of tears in the reconstructed tendons were observed during the follow-up period.

Conclusion

In cases of foot or ankle tendon tears, functional restoration can be achieved by means of reconstruction using the tendon of the semitendinosus muscle. This technique presents advantages in relation to others described previously in the literature. Most of the patients presented excellent or good results.

Conflicts of interest

The authors declare no conflicts of interest.

REFERENCES

1. Cury RPL, Severino NR, Camargo OPA, Aihara T, Oliveira VM, Avakian R. Reconstrução do ligamento cruzado posterior com enxerto autólogo do tendão do músculo semitendinoso duplo e do 0terço médio do tendão do quadríceps em duplo túnel no fêmur e único na tíbia: resultados clínicos em dois anos de seguimento. Rev Bras Ortop. 2012;47(1):65–73.
2. Maffulli N, Ajis A, Longo UG, Denaro V. Ipsilateral free semitendinosus tendon graft transfer for reconstruction of chronic tears of the Achilles tendon. BMC Musculoskelet Disord. 2008;9:100.
3. Ji JH, Kim WY, Kim YY, Lee YS, Yoon JS. Semitendinosus tendon augmentation for a large defect after Achilles tendon rupture: two case reports. Foot Ankle Int. 2007;28(10):1100–3.
4. Kosaka T, Yamamoto K. Long-term effects of chronic Achilles tendon rupture treatment, using reconstruction with peroneus brevis transfer, on sports activities. West Indian Med J. 2011;60(6):628–35.
5. Maffulli N, Spiezia F, Longo UG, Denaro V. Less-invasive reconstruction of chronic Achilles tendon ruptures using a peroneus brevis tendon transfer. Am J Sports Med. 2010;38(11):2304–12.
6. Wang CC, Lin LC, Hsu CK, Shen PH, Lien SB, Hwa SY, et al. Anatomic reconstruction of neglected Achilles tendon rupture with autogenous peroneal longus tendon by EndoButton fixation. J Trauma. 2009;67(5):1109–12.
7. Miao X, Wu Y, Tao H, Yang D. Reconstruction of chronic Achilles tendon rupture with flexor hallucis longus tendon harvested using a minimally invasive technique. Zhongguo Xiu Fu Chong Jian Wai Ke Za Zhi. 2011;25(7):796–9.
8. Carter TR, Fowler PJ, Blokker C. Functional postoperative treatment of Achilles tendon repair. Am J Sports Med. 1992;20(4):459–62.
9. Mandelbaum BR, Myerson MS, Forster R. Achilles tendon ruptures. A new method of repair, early range of motion, and functional rehabilitation. Am J Sports Med. 1995;23(4): 392–5.
10. Kitaoka HB, Alexander IJ, Adelaar RS, Nunley JA, Mayerson MS, Sanders M. Clinical rating systems for the ankle – hinfoot, midfoot, hallux and lesser toes. Foot Ankle Int. 1984;15(7):349–53.
11. Leppilahti J, Puranen J, Orava S. Incidence of Achilles tendon rupture. Acta Orthop Scand. 1996;67(3):277–9.
12. Krueger-Frank M, Siebert CH, Scherzer S. Surgical treatment of ruptures of the Achilles tendon: a review of long-term results. Br J Sports Med. 1995;29(2):121–5.