Treatment of talar osteochondral lesions with autologous osteochondral grafts: indications and technical details

Tratamento das lesões osteocondrais do tálus com enxerto osteocondral autólogo: indicações e detalhes técnicos

Marcelo Pires Prado[1], John Kennedy[2], Youichi Yasui[3]

Abstract

The authors discuss indications and technical details of autologous osteochondral grafts in treating talar osteochondral lesions, based on recent literature prognostic factors, highlighting the relationship between good clinical results and a technically correct surgical procedure.

Keywords: Talus/injuries; Bone transplantation/methods; Transplantation, autologous; Prognosis

Resumo

Os autores discutem as indicações e os detalhes técnicos do tratamento cirúrgico das lesões osteocondrais do tálus por meio da realização de enxertia autóloga osteocondral, baseados nos fatores prognósticos presentes na literatura recente, chamando atenção para os cuidados que devem ser tomados para a realização de um procedimento tecnicamente correto, que se relaciona com os melhores resultados possíveis observados na literatura.

Palavras-chave: Talus/lesões; Transplante ósseo/métodos; Transplante autólogo; Prognóstico

Corresponding author
Marcelo Pires Prado
Rua Ruggero Fasano, s/n, 3º andar, consultório 322
CEP: 05653-120 – São Paulo (SP), Brasil
E-mail: marcelopprado@yahoo.com

Received on
25/9/2015
Accepted on
12/11/2015

Study carried out in Hospital Israelita Albert Einsten.
[1] Hospital Israelita Albert Einstein, São Paulo, SP, Brasil.
[2] Hospital for Special Surgery, New York, Estados Unidos.
[3] Department of Orthopedics, Teikyo University Hospital, Tóquio, Japão.
Funding source: no.
Conflict of interest: no.

INTRODUCTION

Osteochondral lesions affect the chondral surface and the subchondral bone. The talus is a frequently affected bone, and many cases are secondary to a significant trauma, including ankle sprain, a high prevalence injury in young and active patients,[1,2] affecting one in 10,000 people daily, in United States.[3]

Chronic ankle instability causes overload of the chondral surface and may be responsible for up to 25% of patients with osteochondral lesions of talus.[4] Ankle fractures also present a substantial risk for chondral injury, with rates reported to be as high as 73%(sixty-one of eighty-four acute ankle fractures).[5]

A Cochrane review performed by Loveday et al. concluded that there was a lack of evidence to determine which operative treatment strategy is most beneficial in treating osteochondral lesions of the talus.[6]

Treatment options include reparative procedures (bone marrow stimulation) and replacement procedures (autologous osteochondral grafts – AOTS, fresh cadaveric osteochondral grafts, chondrocytes transplantation) and biologic adjuvants (PRP and BMAC, for example). Typically, larger cystic lesions are treated with AOTS.

We describe the surgical technique of the AOTS technique, in which an osteochondral graft is harvested from the ipslateral lateral femoral trochlea, and transplanted to the talus.

SURGICAL TECHNIQUE

The lesion is exposed by a longitudinal anterior lateral or medial incision.

In the lateral approach, the anterior and lateral talar trochlea is exposed. If the lesion continues under the lateral malleolous or if the lesion is not visible using plantar flexion, a fibular osteotomy can be used.

This osteotomy begins at the level of the ankle joint in the anterior fibular border, and progress obliquely to the fibular metaphysis, reaching the posterior fibular border around 5cm from the joint space level (Figure 1). The distal fragment is freed from its soft tissue attachments, keeping the lateral ligaments intact, and posteriorly or distally displaced, allowing the complete visualization of the lesion.

For the medial lesions, an inverted V or chevron medial malleolar osteotomy is done, starting at the medial metaphysis of the distal tibia, and progressing to the joint line. In order to make it safer, a Kirschner wire is inserted in the osteotomy area, reaching the joint line at the level of the lesion, with radioscopic control. After the osteotomy is performed using a thin and long oscillating saw that progresses touching the Kirschner wire, up to the joint line, creating a Chevron like medial malleolous osteotomy, or a step cut osteotomy, done in the frontal plane (Figure 2), that allow the exposition of the lesion area.

After preparing the lesion area, the measurement of the lesion size is done using the appropriate tool. The recipient trephine is used to create a cylindrical space where the graft is going to be introduced. The trephine needs to be inserted perpendicularly to the chondral surface, to allow the proper positioning of the graft.

After removing the graft from the lateral femoral trochlea, by a longitudinal lateral short incision, using the donor

Figure 1. Lateral maleolar osteotomy line seen on lateral ankle X ray.

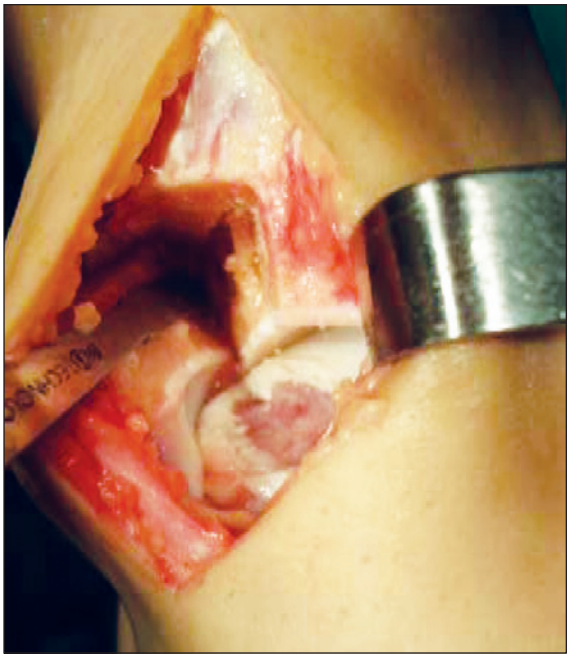

Figure 2. Step cut medial maleolous osteotomy.

trephine, perpendicularly placed over the chondral surface, the graft is transferred to the prepared lesion site.

The surgeon marks with a pen the higher talar area, and the corresponding higher spot on the graft to try to match them. The graft is introduced in the talar recipe area.

If after the introduction of the graft the position is not perfect, it is possible to remove it using a 1.0 threaded Kirschner wire in the middle of the graft (Figure 3), and pull it out moving the Kirschner wire from side to side.

After the proper positioning of the graft the joint is inspected, and washed to remove bone debries.

The osteotomy is reduced and fixed, using interfragmentary screws or a posterolateral plate for the lateral malleolous osteotomy, and using two oblique and a transverse screw for the medial osteotomy (Figure 4).

After that the skin is closed in a conventional manner.

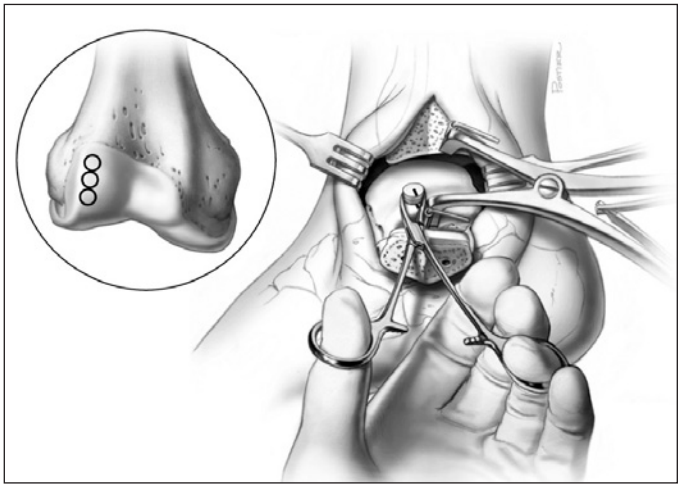

Figure 3. Placement of grafts on talar dome. Source: drawing from Dr. JK archives, with permission.

Figure 4. Fixation options for medial malleolar osteotomy.

DISCUSSION

Talar osteochondral lesions are challenging problems for orthopedic surgeons. In the reparative techniques, including microfracture or microdrilling, results can deteriorate over time passes,[7] while trend is some evidence that bone marrow stimulation techniques can be used repetitively, this way creates further problems,[8] increasing lesion size, depth, and severity.[9]

Factors that influence the results of bone reparative procedures are lesion size greater than 1.5cm^2,[10-12] in part because the shear stress and compressive resistance of scar fibrous tissue is not the same as normal cartilage tissue. Uncontained lesions (without a wall of normal cartilage around the lesion area after debridement) affects prognosis also,[11,13] because the cartilage walls help delimiting scar tissue formation after reparative procedures. Contained lesions normally affect the central talar dome region, and uncontained lesions, the shoulders.[14] Patient age can be a prognostic factor but not always so,[15,16] but some authors disagree with this statement.[17] Cystic and deep lesions have a negative effect on prognosis,[7,18] with poor results reaching 53% in this patient group.[9]

Medial lesions on the non weight bearing surface have also been shown to have a poorer prognosis.[19]

For these situations, the best procedure are replacement surgeries, and among them, the OATS procedure is well described in literature, with predictable outcomes.

The main indication of this procedure are large, recurring[20] and deep (associated with subchondral cysts) osteochondral lesions[21] (Figure 5).

To obtain the 90% plus satisfactory outcomes described in the literature, it is critical to follow optimal technique outlined. The proper positioning of the graft has great importance, due to overload of the graft or surrounding tissue caused by a graft higher placed comparing to the surrounding chondral surface, or under this level (Figure 6).[22]

Donor area problems are not common,[23-26] but authors found 36% of patients with complaints affecting the knee.[27] Surgeons must be aware with the closing of patellar retinacula, because problems in donor area are often related to a over tightened closure of lateral retinacula.[28] The symptoms are, in most of the times, temporary.[29] The number and size of grafts, patient age or bone mass index does not interfere with symptoms in the knee (Figure 7).[30]

Previous procedures, number of used grafts, need of malleolar osteotomies or the presence of degenerative arthritis do not impact significantly outcomes following AOTS.[31]

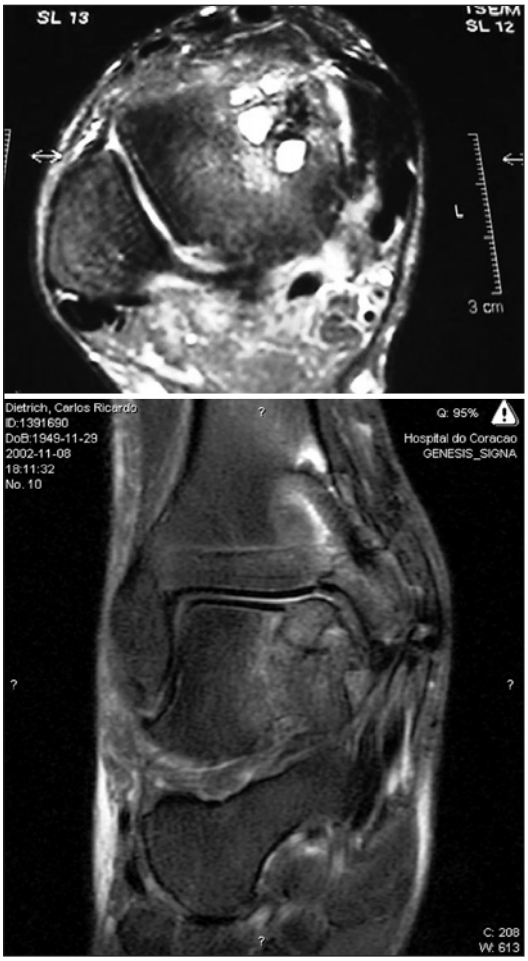

Figure 5. Large, recurred and deep osteochondral talar lesion pre and post autologous osteochondral grafts procedure.

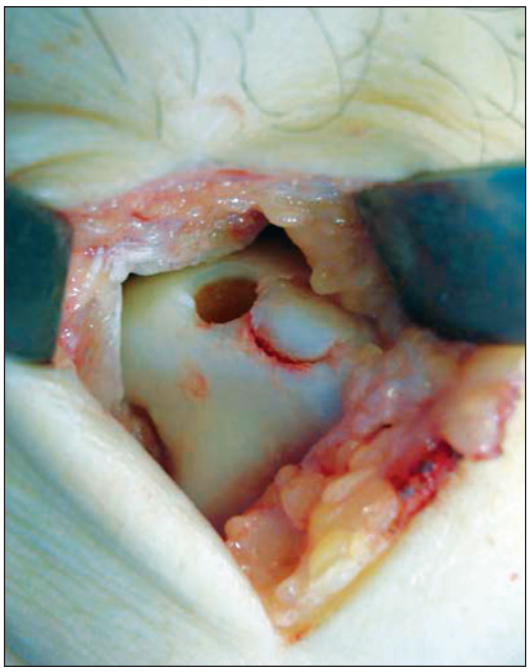

Figure 6. Proper graft alignment.

Figure 7. Magnetic resonance image of a 5 year follow-up donor site in an asymptomatic patient.

Figure 8. Incongruency of medial maleolar osteotomy.

Perfect reduction of the osteotomy is important to prevent incongruences or soft tissue interposition impact, causing problems in this area.[32] The T2 mapping of both medial and lateral osteotomy have been reported showing excellent restoration of cartilage congruency and functional outcome (Figure 8).

COMMENTS

The AOTS procedure in treating osteochondral lesions of the talus has excellent results in selected patients. Surgeons must be aware to the use of proper surgical technique to high patient level of satisfaction.

REFERENCES

1. Baltzer AW, Arnold JP. Bone-cartilage transplantation from the ipsilateral knee for chondral lesions of the talus. Arthroscopy. 2005;21(2):159-66.

2. Frenkel SR, Di Cesare PE. Degradation and repair of articular cartilage. Front Biosci. 1999;4:D671-85.

3. Flick AB, Gould N. Osteochondritis dissecans of the talus (transchondral fractures of the talus): review of the literature and new surgical approach for medial dome lesions. Foot Ankle. 1985;5(4):165-85.

4. Hintermann B, Boss A, Schäfer D. Arthroscopic findings in patients with chronic ankle instability. Am J Sports Med. 2002;30(3):402-9.

5. Murawski CD, KennedyJG. Operative treatment of osteochondral lesions of the talus. J Bone Joint Surg Am. 2013;95(11):1045-54.

6. Loveday D, Clifton R, Robinson A. Interventions for treating osteochondral defects of the talus in adults. Cochrane Database Syst Rev. 2010;(8):CD008104.

7. Ferkel RD, Zanotti RM, Komenda GA, Sgaglione NA, Cheng MS, Applegate GR, et al. Arthroscopic treatment of chronic osteochondral lesions of the talus: long-term results. Am J Sports Med. 2008;36(9):1750-62.

8. Savva N, Jabur M, Davies M, Saxby T. Osteochondral lesions of the talus: results of repeat arthroscopic debridement. Foot Ankle Int. 2007; 28(6):669-73.

9. Robinson DE, Winson IG, Harries WJ, Kelly AJ. Arthroscopic treatment of osteochondral lesions of the talus. J Bone Joint Surg Br. 2003; 85(7):989-93.

10. Chuckpaiwong B, Berkson EM, Theodore GH. Microfracture for osteochondral lesions of the ankle: outcome analysis and outcome predictors of 105 cases. Arthroscopy. 2008;24(1):106-12.

11. Cuttica DJ1, Smith WB, Hyer CF, Philbin TM, Berlet GC. Osteochondral lesions of the talus: predictors of clinical outcome. Foot Ankle Int 2011;32(11):1045-51.

12. Choi WJ, Park KK, Kim BS, Lee JW. Osteochondral lesion of the talus: is there a critical defect size for poor outcome? Am J Sports Med. 2009; 37(10):1974-80.

13. Choi WJ, Choi GW, Kim JS, Lee JW. Prognostic significance of the containment and location of osteochondral lesions of the talus: independent adverse outcomes associated with uncontained lesions of the talar shoulder. Am J Sports Med. 2013;41:126-33.

14. Choi WJ, Jo J, Lee JW. Osteochondral lesion of the talus: prognostic factors affecting the clinical outcome after arthroscopic marrow stimulation technique. Foot Ankle Clin. 2013;18(1):67-78.

15. Deol P, Berlet GC, Hyer CF, et al. Age stratification of outcomes for osteochondral lesions of the talus. Presented at American Orthopedic Foot and Ankle Society Summer Meeting. Vancouver, July 15-18, 2009.

16. Choi WJ, Kim BS, Lee JW. Osteochondral lesion of the talus: could age be an indication for arthroscopic treatment? Am J Sports Med. 2012; 40(2):419-24.

17. Becher C, Thermann H. Results of microfracture in the treatment of articular cartilage defects of the talus. Foot Ankle Int. 2005;26(8):583-9.

18. Scranton PE Jr, McDermott JE. Treatment of type V osteochondral lesions of the talus with ipsilateral knee osteochondral autografts. Foot Ankle Int. 2001;22(5):380-4.

19. Yoshimura I, Kanazawa K, Takeyama A, Angthong C, Ida T, Hagio T, et al. Arthroscopic bone marrow stimulation techniques for osteochondral lesions of the talus prognostic factors for small lesions. Am J Sports Med. 2013;41(3):528-34.

20. Kreuz PC, Steinwachs M, Erggelet C, Lahm A, Henle P, Niemeyer P. Mosaicplasty with autogenous talar autograft for osteochondral lesions of the talus after failed primary arthroscopic management: a prospective study with a 4-year follow-up. Am J Sports Med. 2006;34(1):55-63.

21. Emre TY, Ege T, Cift HT, Demircioğlu DT, Seyhan B, Uzun M. Open mosaicplasty in osteochondral lesions of the talus: a prospective study. J Foot Ankle Surg. 2012;51(5):556-60.

22. Latt LD, Glisson RR, Montijo HE, Usuelli FG, Easley ME. Effect of graft height mismatch on contact pressures with osteochondral grafting of the talus. Am J Sports Med. 2011;39(12):2662-9.

23. Hangody L, Fules P. Autologous osteochondral mosaicplasty for the treatment of full-thickness defects of weight-bearing joints: ten years of experimental and clinical experience. J Bone Joint Surg Am. 2003; 85(Suppl 2):25-32.

24. Al-Shaikh RA, Chou LB, Mann JA, Dreeben SM, Prieskorn D. Autologous osteochondral grafting for talar cartilage defects. Foot Ankle Int. 2002;23(5):381-9.

25. Hangody L, Kish G, Modis L, Szerb I, Gáspár L, Diószegi Z, et al. Mosaicplasty for the treatment of osteochondritis dissecans of the talus: two to seven year results in 36 patients. Foot Ankle Int. 2001;22(7):552-8.

26. Scranton PE Jr, Frey CC, Feder KS. Outcome of osteochondral autograft transplantation for type-V cystic osteochondral lesions of the talus. J Bone Joint Surg Br. 2006;88(5):614-9.

27. Rama KR, Apsingi S, Poovali S, Jetti A. Timing of tourniquet release in knee arthroplasty. Meta-analysis of randomized, controlled trials. J Bone Joint Surg Am. 2007;89(4):699-705.

28. Reddy S, Pedowitz DI, Parekh SG, Sennett BJ, Okereke E. The morbidity associated with osteochondral harvest from asymptomatic knees for the treatment of osteochondral lesions of the talus. Am J Sports Med. 2007;35(1):80-5.

29. Schöttle PB, Oettl GM, Agneskirchner JD, Imhoff AB. Operative therapy of osteochondral lesions of the talus with autologous cartilage-bone transplantation. Orthopade. 2001;30(1):53-8.

30. Paul J, Sagstetter A, Kriner M, Imhoff AB, Spang J, Hinterwimmer S. Donor-site morbidity after osteochondral autologous transplantation for lesions of the talus. J Bone Joint Surg Am. 2009;91(7):1683-8.

31. Woelfle JV, Reichel H, Nelitz M. Indications and limitations of osteochondral autologous transplantation in osteochondritis dissecans of the talus. Knee Surg Sports Traumatol Arthrosc. 2013;21(8):1925-30.

32. Kim YS, Park EH, Kim YC, Koh YG, Lee JW. Factors associated with the clinical outcomes of the osteochondral autograft transfer system in osteochondral lesions of the talus: second-look arthroscopic evaluation. Am J Sports Med. 2012;40(12):2709-19.