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CASE REPORT

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En bloc osteochondral autograft in the treatment of osteochondral lesions of the talus: a report of 4 cases

Auto-enxerto osteocondral "em bloco" no tratamento de lesões osteocondrais do tálus: relato de 4 casos

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ABSTRACT

Osteochondral lesions of the talus are common, and the choice of treatment is based on the extent, depth and symptoms. Osteochondral autografts are indicated for large, deep and recurrent lesions. The authors describe the treatment of these lesions using an en bloc osteochondral autograft obtained from the lateral trochlea of the ipsilateral knee performed in 4 ankles and evaluate the outcomes in the medium term with regard to complaints in the recipient site, donor site and aspect of the reconstructed site. The described procedure proved to be effective in the treatment of complex osteochondral lesions of the talus, restoring the normal functional pattern in the final evaluation.

Level of Evidence V; Therapeutic Studies; Expert Opinion.

Keywords: Transplantation, autologous; Talus; Osteochondritis.

RESUMO

As lesões osteocondrais do tálus são comuns e a escolha do tratamento baseia-se na extensão, profundidade e sintomas. O enxerto osteocondral autólogo é uma técnica indicada para as lesões grandes, profundas e recorrentes. Os autores descrevem o tratamento dessas lesões por meio de enxerto osteocondral autólogo, "em bloco", obtido da tróclea lateral do joelho ipsilateral, realizado em 4 tornozelos e avaliam o resultado a médio prazo, com referência às queixas na área receptora, área doadora, aspecto da área reconstruída. O procedimento descrito mostrou-se eficiente no tratamento das lesões osteocondrais complexas do tálus, restaurando o padrão funcional normal na avaliação final.

Nível de Evidência V; Estudos Terapêuticos; Opinião do Especialista.

Descritores: Enxerto autólogo; Tálus; Osteocondrite.

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INTRODUCTION

Osteochondral lesions of the talus are often symptomatic, causing pain related to joint effusion and activities, joint blockage and functional loss, especially for sports.

The surgical treatment of these lesions-indicated in symptomatic patients after failure of conservative treatment-can be categorized into biological bone marrow stimulation procedures, replacement procedures such as osteochondral transplants and chondroinduction proce-

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dures through the use of cultured cells with or without different categories of matrices.

Shimozono et al.[1] considered replacement therapy as the main alternative in the treatment of lesions larger than 107 mm^2 in area, including subchondral cysts and surgical revisions.

Kennedy et al. found good results with the use of osteochondral autografts in the short-term follow-up of these lesions[2]; however, there are no studies that support their effectiveness over longer periods.

According to Fansa et al.[3], to restore joint mechanics, osteochondral grafts should seek perfect congruence with the cartilage that surrounds it. Thus, it is believed that lesions of the talar shoulder are more adequately reconstructed, including with respect to double convexity, in the sagittal and coronal planes when grafts harvested in a single block from the free margin ("shoulder") of the lateral femoral trochlea are used.

The advantages of the method are (1) the low incidence of complaints and complications related to the donor site since the area from which the graft is removed is not a load-bearing area, and thus a progressive reduction in local morbidity can be expected[4]; and (2) a greater likelihood of good results due to the reduction of "uncovered areas", which is common in mosaicplasty techniques and observed in the boundary zones between the transplanted cylinders.

The objective of this study is to present the results in the medium term of the en bloc osteochondral autograft surgical technique performed in three patients (four ankles) considering the following variables: sex, location, lesion size, American Orthopedic Foot and Ankle Score (AOFAS) and bone and cartilage quality.

CASE REPORT

This study was approved by the Research Ethics Committee with registration in the Brazil Platform under CAAE number: 12315119.5.0000.0071.

The procedure described below was performed in three patients (four ankles) between October 2006 and June 2016.

Surgical procedure

Patients were placed in the supine position.

Considering that all lesions in this sample were located in Raikin zones 4 and 7, the ankle joint was approached through a longitudinal rectilinear incision over the distal metaphyseal tibia (Figure 1). Through a rectilinear and oblique osteotomy directed toward the angle between the articular surface of the tibia and the medial malleolus ("tibial axilla"), the lesions were exposed (Figure 2). All devitalized tissues from the lesioned area were then removed with the aid of fine osteotomes, creating a hexahedral defect in the recipient site. For each case, this three-dimensional defect was carefully measured, and through a lateral parapatellar incision, a graft with the exact shape and dimensions was harvested from the highest and most lateral portion of the lateral femoral condyle (Figure 3).

The graft was transferred to the recipient site and temporarily fixed with Kirschner wires (1 mm). Once the adequacy of its reduction was confirmed, the graft was fixed to the lesion bed with two headless cannulated screws and placed perpendicular to the superior articular surface of the talus in a slightly convergent orientation. After the graft transfer and fixation stage, the tibial malleolus was repositioned and fixed with two 3.5 mm screws in an orthogonal arrangement (Figure 4).

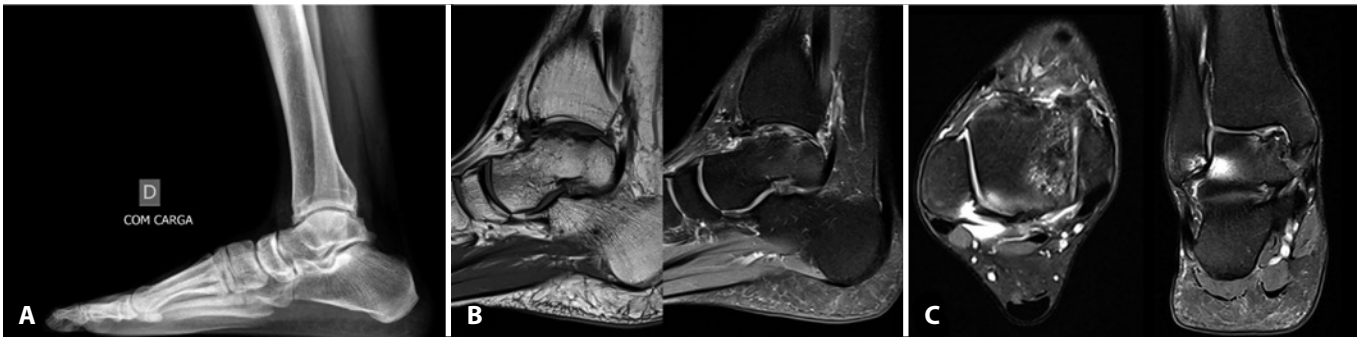

Figure 1. Preoperative image of patient #3: A) Simple radiograph of the right ankle in profile view showing the formation of osteophytes on the anterior margin of the tibia; B) Magnetic resonance imaging sagittal sections of the ankle where the large osteochondral lesion is clearly shown; C) Transverse and coronal sections of the same ankle showing the lesion at the medial border of the talus.
Source: Authors' personal archive.

The surgical wounds were closed and treated as usual, and the patients were immobilized with an orthopedic boot and directed to maintain a non-weight-bearing regime of the operated limb for 8 weeks.

At the end of the 8th postoperative week, a gradual increase in weight bearing on the operated limb was allowed, which progressed to full weight bearing at the end of the 10th week. The patients were evaluated during periodic consultations through physical examination and 3-Tesla magnetic resonance imaging with T2 mapping for cartilage evaluation, performed at 3-4 months and 2-3 years after surgery.

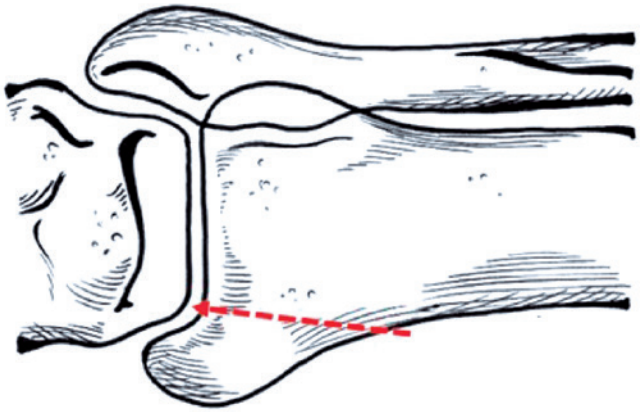

Figure 2. Diagram illustrating the orientation of the medial malleolus osteotomy used in the patients (dotted line).
Source: Authors' personal archive.

RESULTS

Three patients (4 ankles) with a mean age of 30 years were subjected to the described procedure. The average duration of symptoms was 3.75 years. Two patients (3 ankles) were male and one was female. In 100% of the treated ankles, the lesions were located in Raikin zones 4 and 7.

The mean lesion area was 752 mm^2, ranging from 565 to 1131 mm^2.

The mean preoperative and final AOFAS was 48 points and 90 points, respectively, indicating a "relative improvement" of 187%.

Complementary surgical procedures were performed on 3 ankles (75%), namely, the Brostrom (2 ankles) and Dwyer (1 ankle) procedures.

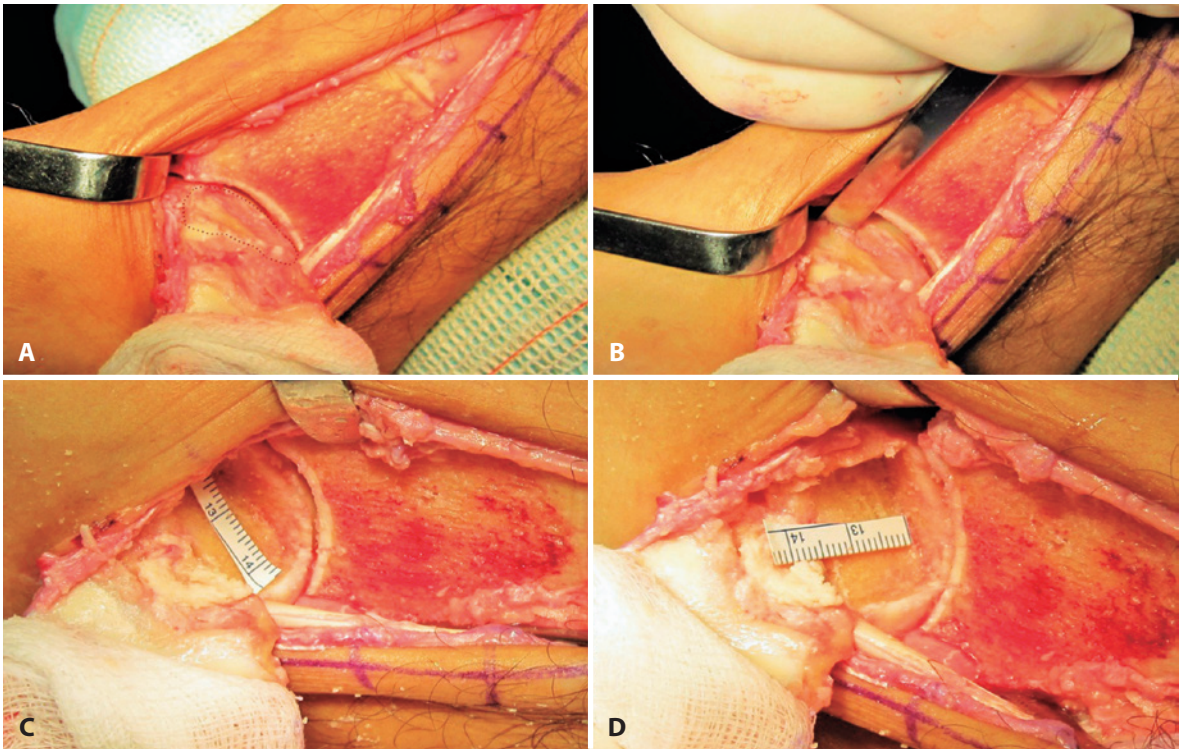

Figure 3. Intraoperative images of patient #3: A) After osteotomy of the medial malleolus and exposure of the talus, it is possible to clearly delineate the lesioned area of the talar articular cartilage (dotted line); B) Delimitation of the boundaries between the normal cartilage and injured cartilage and removal of the injured tissue en bloc with the aid of delicate chisels; C and D) Detailed measurement of the lesion after the end of debridement and resection of the pathological osteochondral tissue.
Source: Authors' personal archive.

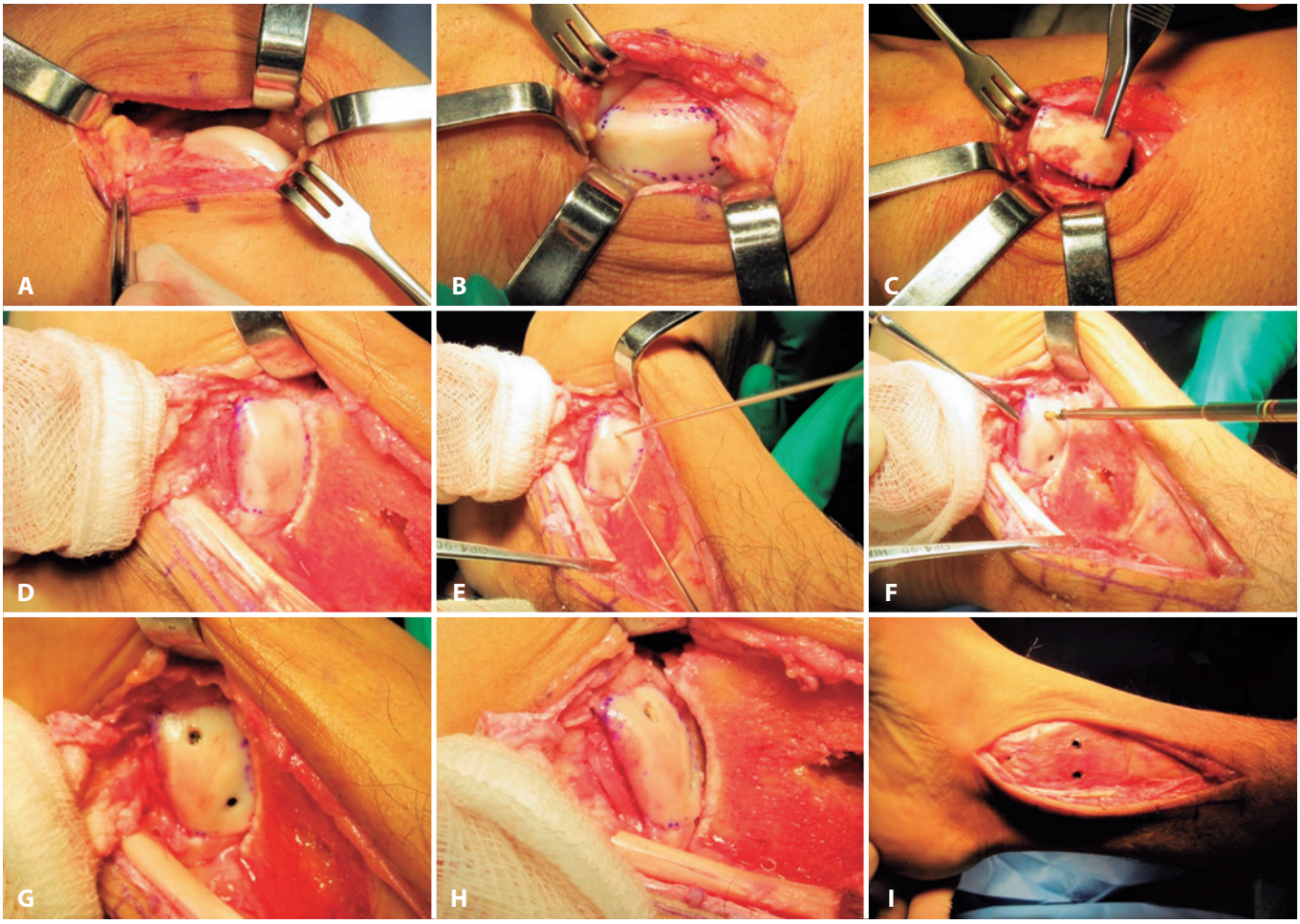

Figure 4. A) Lateral parapatellar incision exposing the lateral femoral condyle; B) Demarcation of the osteochondral block to be removed from the donor site based on the measurements obtained in the recipient site; C) Osteochondral block to be transplanted to the talus; D) Osteochondral block fitted under pressure to the recipient site in the talus; E) Temporary fixation with Kirschner wires that will serve as guides for the introduction of cannulated screws used in the permanent fixation; F) Definitive fixation with metal cannulated double-threaded screws (proximal and distal ends); G) Osteochondral graft transplanted and fixed in its bed on the talus; H) Medial view of the newly transplanted osteochondral block fixed to the talus; I) Replacement of the medial malleolus and fixation to the tibia with screws in different planes.
Source: Authors' personal archive.

The mean postoperative follow-up time was 5.8 years, ranging from 2 years and 7 months to 12 years and 3 months (Figure 5).

The analysis of the final images of the studied patients showed complete integration of the bone portion of the grafts to the lesion bed (without signs of sagging, atrophy or bone necrosis) in all cases, in addition to adequate and complete coverage of the lesion area by cartilage, with characteristics similar to the hyaline cartilage of the rest of the talar surface (T2 maps).

The three patients (4 ankles) remained asymptomatic during follow-up and resumed their normal gait, usual daily and work activities, and the medium-intensity physical activities they performed prior to the onset of symptoms.

All patients reported being satisfied with the procedure at the final evaluation and would recommend it to a friend.

DISCUSSION

Osteochondral lesions of the talus are relatively common, and the literature has guided their treatment depending on the size, depth and whether the lesion is primary. Osteochondral autograft is a replacement technique indicated for large, deep and recurrent lesions (after failure of repair procedures such as bone marrow stimulation)[1,6].

The clinical and radiological results are homogenously good in the literature[1], but failures occur in up to 10% of patients[4].

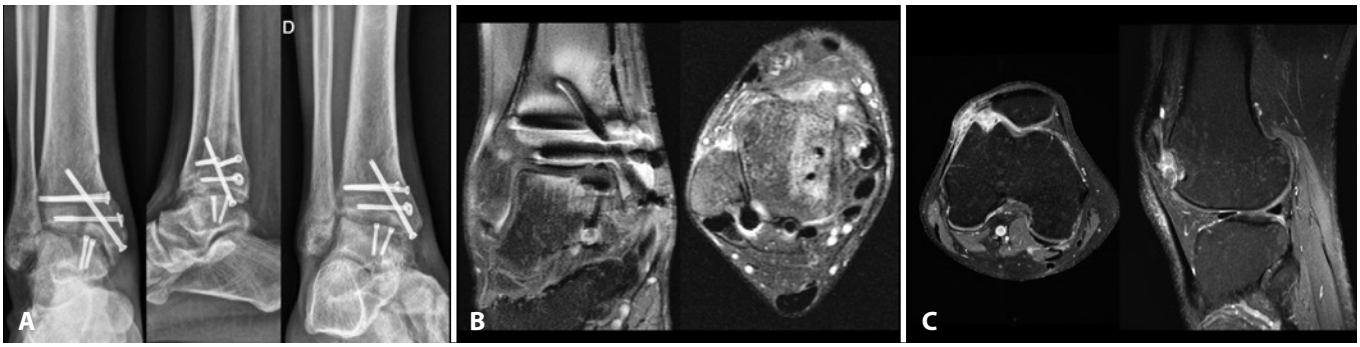

Figure 5. Images of patient #3 after completing 4 postoperative months: A) Ankle radiographs (frontal, profile, oblique); B) Coronal and transverse sections of the operated ankle showing the integration of the en bloc osteochondral graft with the recipient site bed in the talus; C) Magnetic resonance images of the right knee still showing the hyperintense signal surrounding the donor site that is gradually filled and regularized. The patient had no knee complaints at this time.
Source: Authors' personal archive.

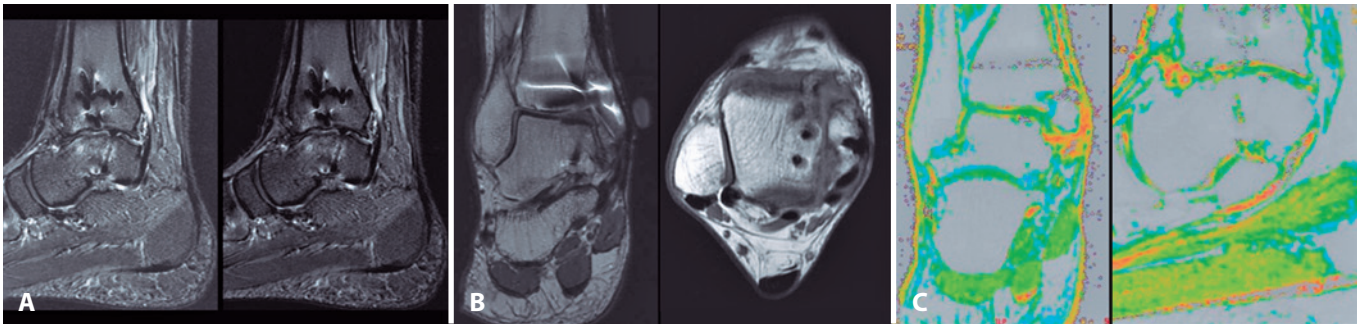

Figure 6. Images of patient #3 at the completion of 3 years and 6 months after surgery: A) Sagittal sections of the ankle showing complete integration of the osteochondral graft to the recipient site in the talus. Despite the slight irregularity of the articular surface and the slight medullary hypersignal in the body of the talus, there were no symptoms at this time; A) Coronal and transverse sections of the ankle once more point to the complete integration of the en bloc osteochondral graft; C) T2 maps obtained from the analysis of MRI images show the regularity of the hyaline cartilage over the area where the integration of the graft occurred; the bright green color evenly covering the contact surfaces between the distal tibia and the talar dome indicates the integrity and homogeneity of the hyaline tissue located there.
Source: Authors' personal archive.

Technically, the congruence of the graft's cartilage surface should be perfect, matching with the cartilage level of the recipient site because misalignments of 1 mm can cause important overloads on the edges of the cartilage of the transplanted cylinder or of the recipient site[3].

The lateral femoral condyle is the ideal donor site for the repair of lesions of the talus because it has a radius of curvature similar to that of the talar dome and allows obtaining up to three contiguous osteochondral cylinders. It is a region subjected to lower mechanical pressure than other areas of the knee[5], basically being an area of slippage, and presenting a low incidence of complications[2]. The morbidity rate relative to the donor site is approximately 4% and decreases over time[1].

One of the main concerns with the performance of multiple autologous grafts-a technique known as mosaicplasty-is the lack of uniform coverage of the lesioned area because the creation of uncovered areas of subchondral bone between the transplanted osteochondral cylinders is common[7].

When larger lesions need to be treated, the morbidity of the donor site increases, and allografts should be considered as alternatives, as they offer similar results[6,8]. In these cases, it is suggested that the cylinders should be removed from the same anatomical area of the cadaveric talus used as the donor, which should preferably be used before 28 days of storage to ensure the feasibility of the largest possible number of transplanted chondrocytes. The allografts can be fresh and not frozen[9] and can be cylindrical or en bloc, depending on the need of the host site. The rates of allograft failure and collapse can reach 67%, which causes great concern regarding the morbidity of the method and decisively influences decision-making and therapeutic choice[10].

For intermediate cases, when it is necessary to use up to three cylinders, large defects are created in the donor area, with thin bone and cartilage bridges between the defects, which does not ensure adequate support of the pressure related to body weight load[4]. To address this issue, the alternative of removing the injured area en bloc and replacing it with an osteochondral block with equal dimensions was devised.

Four ankles were treated in this way with very satisfactory results (mean postoperative AOFAS= 90 points) after a mean follow-up of 5.8 years (Figure 6), with no complaints regarding the donor site.

CONCLUSION

The described procedure was effective in the treatment of large osteochondral lesions of the talus that affect the talar shoulder, presenting favorable results for both the donor and recipient areas in a medium-term clinical follow-up.

Authors' contributions: Each author contributed individually and significantly to the development of this article: GBBS *(https://orcid.org/0000-0001-9004-3909) wrote the article, interpreted the results of the study and participated in the review process; CASN *(https://orcid.org/0000-0002-9286-1750) conceived and planned the activities that led to the study, interpreted the results of the study, participated in the review process and approved the final version; MPP *(https://orcid.org/0000-0003-0325-8050) wrote the article, interpreted the results of the study, participated in the review process and approved the final version; FFMA *(https://orcid.org/0000-0002-7664-2064) participated in the review process and approved the final version; ALGS *(https://orcid.org/0000-0002-6672-1869) participated in the review process and approved the final version. *ORCID (Open Researcher and Contributor ID).

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