Injury, Int. J. Care Injured 43 (2012) 1118–1123

Contents lists available at SciVerse ScienceDirect

Injury

journal homepage: www.elsevier.com/locate/injury

Clinical outcomes of autogenous cancellous bone grafts obtained through the portal for tibial nailing

Moses Lee, Hyung-Keun Song, Kyu-Hyun Yang *

Department of Orthopaedic Surgery, Yonsei University College of Medicine, Seoul, Republic of Korea

ARTICLE INFO

Article history:
Accepted 28 February 2012

Keywords:
Cancellous bone graft
Tibia
Intramedullary nail

ABSTRACT

Background: The purpose of this study is to introduce and review the clinical outcomes of a new technique for harvesting autogenous cancellous bone grafts in association with tibial intramedullary (IM) nailing.
Materials and methods: We retrospectively reviewed 21 patients who received autogenous cancellous bone grafts obtained from the entry portal of a tibial IM nail for fracture gaps, malalignment or nonunion in the lower extremities. All patients were scheduled to receive IM nailing or had already received IM nailing for the fixation of an ipsilateral tibia shaft fracture. A total of 33 patients who received only tibial IM nailing were selected as a control group. Through the follow-up, postoperative complications related to the bone harvest were monitored. Further by taking serial X-rays, radiographic changes of the donor site and the knee joint were closely observed. Knee pain (visual analogue scale (VAS)) and function (Lysholm knee score) were compared between the study group and the control group.
Results: At the last follow-up, the average VAS in the study group was 1.28 (0–5), which was not significantly different from the control group (VAS: 1.36, range 0–7) ($P = 0.985$). The range of motion of the knee joint was similar in both groups, averaging 130.23° (range: 115–135°) and 131.36° (range: 115–135°), respectively. There was no significant difference in the Lysholm knee score between the study and control groups ($P = 0.610$). All patients exhibited complete fracture healing at an average of 6 months and no complications associated with the bone donor site were observed.
Conclusions: By using the new technique, autogenous cancellous bone grafting can be performed conveniently and safely to treat fracture gaps, malalignment or nonunion in the lower extremities without additional morbidity at the donor site.

Although several bone substitutes have been introduced and commercialised, autogenous bone grafting is still preferred due to its effectiveness.[1–6] Autogenous cancellous bone grafting is a particularly useful treatment for bone defects or nonunions after lower extremity fractures, including tibial shaft fractures. Even though the iliac crest is the most popular donor site, it is cumbersome to prepare a separate operation site. Further, approaching and closing the second wound is time consuming. Moreover, such operations incur many possible complications and postoperative morbidities. For these reasons, the search for alternate donor sites has continued.[7–12]

Besides the iliac crest, the distal femur, proximal tibia, distal tibia, fibula and calcaneus are possible lower extremity bone graft donor sites.[13–15] Several studies have reported the use of the proximal tibia as a bone graft donor site.[7–9,11,12] However, all of these prior studies used a separate incision to approach the proximal metaphysis of the tibia.[8,9,11,12] Unlike previous methods, we harvested autogenous cancellous bone from the proximal tibia through the entry portal of the intramedullary (IM) nail. Postoperative outcomes were retrospectively reviewed, and knee pain and function were compared with those of patients who received tibial nailing alone without bone harvesting.

Patients and methods

Patients

This study was approved by our institutional review board. From August 1998 to January 2009, patients who met the following conditions were selected to receive autogenous bone grafts using the new technique:

(1) a patient who was scheduled to receive tibial IM nailing,
(2) a patient who had already received IM nailing for the fixation of an ipsilateral tibia shaft fracture and was scheduled to remove or exchange the nail,

* Corresponding author at: Department of Orthopaedic Surgery, Yonsei University College of Medicine, Gangnam Severance Hospital, Dogok-dong, Gangnam-gu, Seoul 135-720, Republic of Korea. Tel.: +82 2 2019 3414; fax: +82 2 573 5393.
E-mail addresses: kyang@yuhs.ac, kyang@yumc.yonsei.ac.kr (K.-H. Yang).

0020–1383/$ – see front matter © 2012 Elsevier Ltd. All rights reserved.
doi:10.1016/j.injury.2012.02.021

(3) accompanying concomitant problems at the same leg, which needed a cancellous bone graft and
(4) normal proximal tibial anatomy with intact knee joint, which was confirmed by preoperative X-rays.

Further, the exclusion criteria were specified as follows:

(1) patients who had any joint lesions due to systemic disease (rheumatoid arthritis, gout or other connective tissue disease),
(2) a history of a fracture at the same leg or previous operation involving the knee joint (menisectomy, anterior cruciate ligament (ACL) reconstruction or other soft-tissue surgeries) and
(3) patients who needed structural bone graft.

Twenty-one patients met the inclusion criteria and were eligible for the study group. Using the patients' medical records, we reviewed age at time of presentation, gender, history of trauma, initial symptoms and durations, as well as the number of previous operations. All the patients underwent autogenous bone grafting from the proximal tibial metaphysis due to a bone defect after fracture or its complications, such as malalignment or nonunion,

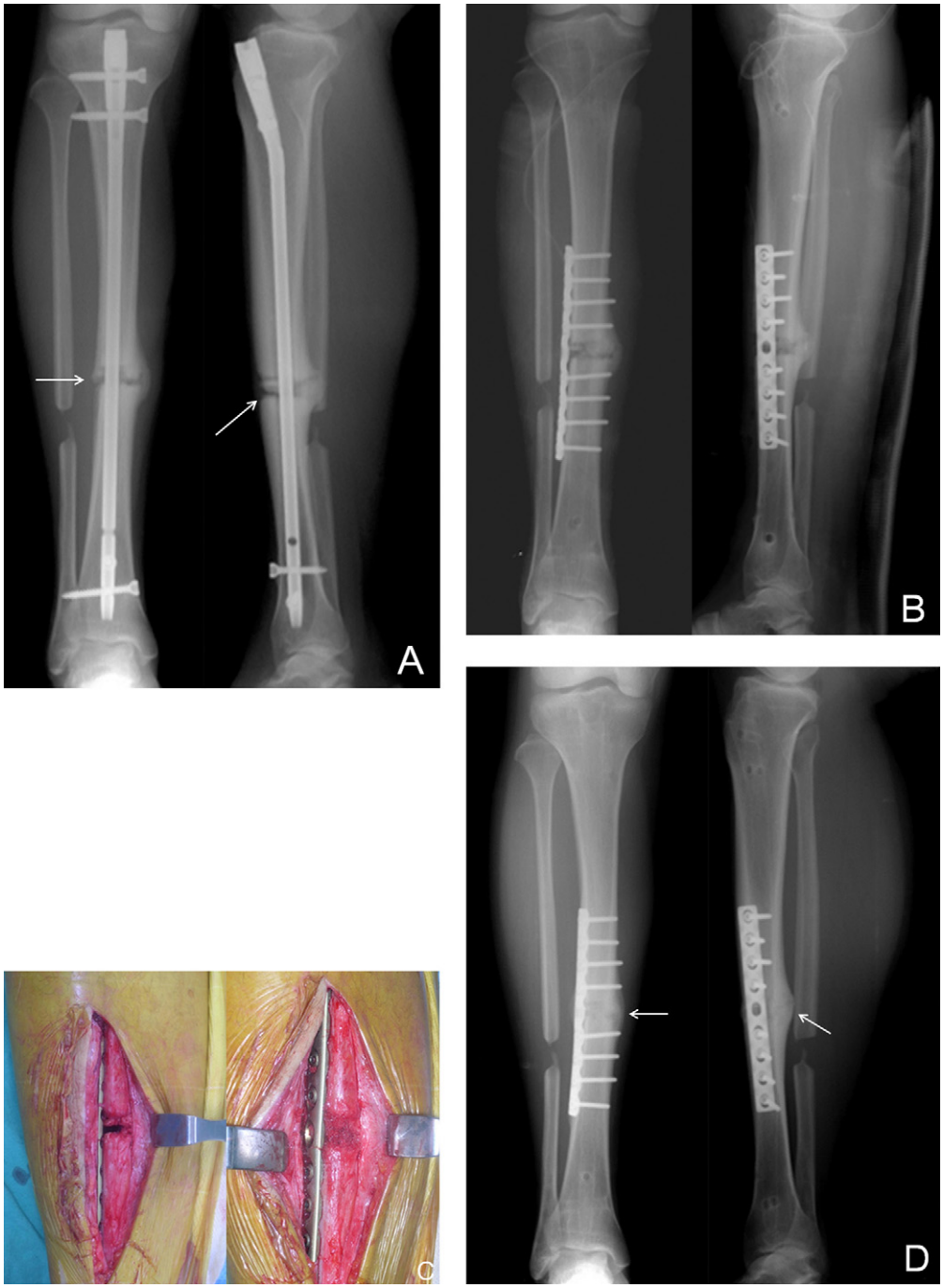

Fig. 1. (A) Initial radiograph of a 36-year-old female presenting nonunion of the tibia after lengthening osteotomy to correct leg length discrepancy (11 months after first operation). Arrows indicate the nonunion site. (B) Post-operative radiographs; the previous IM nail was converted to plate fixation with the new tibial bone graft technique (C) Intra-operative photograph demonstrating the nonunion site before and after bone grafting. (D) Radiograph after six months; presenting complete union (arrows).